

2023

Project Update Report





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Photo: Construction of the Ventura Street Undercrossing

The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building and operating the first high-speed rail in the nation. California high-speed rail will connect the mega-regions of the state, contribute to economic development and a cleaner environment, create jobs and preserve agricultural and protected lands. When it is completed, it will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of exceeding 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations. In addition, we are working with regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.



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From the CEO

This is the California High-Speed Rail Authority's 2023 Project Update Report.

When the Authority submitted its 2022 Business Plan to the legislature last year, so much about our program was in flux: The legislature had not appropriated Proposition 1A bond funds to the project; management was working hard on settling old disputes with contractors—fights over ill-defined project scope and related commercial settlements; we had just initiated work with the California State Transportation Agency and Caltrans on a new ridership model; we were defining a relatively new concept for a sensible early operating segment – 171 miles connecting Merced, Fresno and Bakersfield; and, after several years of relative absence as a partner, the federal government came roaring back as a key participant in this project with the passage of the Infrastructure Investment and Jobs Act (IIJA) and potentially billions of dollars to help California build the nation's first truly high-speed rail project. There was a lot we did not know at the time, and we acknowledged that.

We described the project elements we were advancing, and we developed the 2022 Business Plan as a “bridge document” to this 2023 Project Update Report. We indicated that we would use this report to provide policymakers and the public with vital project updates. In June of last year, when the 2022-23 Budget Act was enacted, the Legislature added additional requirements to this report, including updates on costs, schedules, agreements and milestones related to the 119-mile construction segment and the proposed 171-mile Merced to Bakersfield early operating segment.

This report provides those updates and more. It includes the most comprehensive, risk-based estimates for schedules and costs we have ever per-

formed on the early operating segment. The updated estimates and risk contingencies are in line with Federal Railroad Authority (FRA) and Federal Transit Administration (FTA) guidelines for megaprojects. This report also includes updates to our ridership estimates for each operating segment that we proposed as part of our strategy to build the Phase 1 project. Finally, this report describes important project advancements and our multiyear strategy to pursue and obtain federal grants to advance the project over the next five years.

These updates and enhanced analyses come at a tough time for megaprojects and public transit broadly.

First, public transit ridership in California and across the nation is down. That reduction is largely attributable to more stagnant population growth and employment patterns that are different than before, where employees travel to work fewer days per week, utilizing less transit. Transit agencies have also not fully recovered from the ridership fall that resulted from the COVID-19 pandemic. Interregional travel, like air travel and intercity rail travel, has stabilized. Our enhanced ridership projections included in this report reflect these trends. Although they show reduced ridership numbers, the projected ridership is still robust, and the San Francisco to Los Angeles/Anaheim service would be the most-traveled intercity passenger service in the nation.

Second, the impacts of the COVID-19 pandemic on global supply chains and the resulting market instability and inflation have impacted prices for construction commodities like concrete and steel as well as labor. Large infrastructure projects all over the world have felt the impact of this market instability. We are not immune. We have incorporated these impacts into the resetting of our unit prices and in our escalation rates going forward.

These trends, coupled with a more comprehensive project definition for the 119-mile construction segment and the 171-mile Merced to Bakersfield segment (i.e., greater scope that incorporates input from stakeholders and the Legislature), and an enhanced contingency for risk necessary to meet federal cost estimating guidelines, result in cost estimates higher than we identified in the 2022 Business Plan. We reflect these estimates and the cost drivers in Chapter 3 of this report.

As promised, we also updated project schedules for completing the 119-mile construction segment and for getting the Merced to Bakersfield segment operational. Although we maintain our goal to become operational by the end of 2030, we recognize that stabilized funding dedicated to that objective is required to make it so. When we apply a risk factor to our schedule, the result is a “schedule envelope” for operations to commence between 2030 and 2033. The Authority will deploy strategies to advance work and mitigate schedule impacts, as discussed in Chapter 1 of this report.

The result of our analysis, as contained in this report, reflects a continuing challenging environment to advance this transformative project. More than anything, the project needs stabilized, long-term funding. We have been engaged with our federal partners about this challenge, and we believe that we have a strong strategy to be successful at the federal level. At home, we need an answer on how this project will be funded after 2030. Megaprojects that last for decades need long-term, stable funding. Every country around the world that has built high-speed rail has dedicated billions of dollars over several decades to see it through. We don’t have one penny of state support for this project identified after 2030. And as the legislative Peer Review Group has advised many times, “That must change.”

Not to be lost in the challenges surrounding this project are the important milestones we have hit and will continue to hit as we advance our work. We just celebrated the creation of more than 10,000

construction jobs in the Central Valley on this project. We have environmentally cleared 422 miles of the 500-mile San Francisco-LA/Anaheim Phase 1 segment, including continuous clearance between San Francisco and Los Angeles County. We have now secured nearly all of the right of way (96%) needed to complete the 119 miles of construction underway. We have started advanced design on the country’s first high-speed rail stations in the Central Valley and on the line extensions to Merced and Bakersfield, ensuring that we will deliver those extensions the right way, with much less risk of delay and cost going forward.

So where does this all leave us? Moving forward.

Our next steps are to utilize the funds we have to complete our work on the 119 miles now in construction. We owe this to our federal partner, and we are going to see it through. The first construction package on that segment will reach substantial completion this year. We will bring to our Board later this year a restructured Request for Qualifications (RFQ) to begin laying track in the Central Valley. Beyond the current construction segment, in 2023, we will have advanced the design on the extensions to Merced and Bakersfield such that we will have a right-of-way acquisition plan ready to go and we will have identified the utilities that need to be relocated. By the end of 2023, we will ask our Board to consider certifying the environmental document for the Palmdale to Burbank segment, bringing us to 465 of the needed 500 miles to be environmentally cleared. Finally, and most importantly, in 2023, we will have billions of dollars in grant applications pending at the federal government to enable us to meet our goals.

There’s much to do, and we look forward to advancing the work.



Executive Summary

MAJOR ACCOMPLISHMENTS IN 2022

- Environmental clearance for all segments between San Francisco and Palmdale (Los Angeles County) and between Burbank and Los Angeles – 422 miles.
- On the 119-mile Central Valley Segment under construction:
 - ▶ 100% of the design work on the civil infrastructure has been completed;
 - ▶ 71% of all utility relocations were complete/ in progress; and
 - ▶ 96% of the right-of-way was delivered to contractors.
- The federal American Recovery and Reinvestment Act (ARRA) grant agreement was amended, aligning our revised schedule with our federal partner's expectations.
- Contracts were awarded to begin advanced design work on the extensions to Bakersfield and to Merced.
- Contract was awarded to begin design work on the four Central Valley stations delivered by the Authority – Merced, Fresno, Kings/Tulare and Bakersfield.

UPCOMING MILESTONES IN 2023

- More than 10,000 jobs created since construction commenced;
- Construction Package 4 will reach substantial completion by summer;
- Palmdale to Burbank environmental document to be certified in the fourth quarter;
- Design for the Bakersfield and Merced extensions to reach draft configuration footprint (30% design) by the fourth quarter – with a right-of-way acquisition plan, utility relocation plan and third-party agreements identified; and
- New strategy for procuring the track and systems completed and Request for Qualifications to the Board of Directors.

REPORT SUMMARY

This is the California High-Speed Rail Authority's 2023 Project Update Report (Report). It fulfills the Authority's requirement to update the California Legislature biennially on the development and implementation of intercity high-speed rail service. It also fulfills commitments we made in our 2022 Business Plan to provide updates on our:

- Baseline budget and schedule;
- Capital cost estimates;
- Funding strategy;
- Ridership forecasts;
- Environmental clearance progress; and
- Strategy to advance design on extensions to Merced and Bakersfield and Central Valley stations.

WHERE WE STAND TODAY

The Authority's mission is to deliver an electrified high-speed rail system that will carry passengers between San Francisco and Los Angeles in under three hours. In 2008, when California's voters approved Proposition 1A, they approved an initial down payment of \$9 billion to build the system. Since then, we have secured \$3.5 billion in federal funds and the State has provided annual appropriations of Cap-and-Trade Program funds, a program which expires in 2030.

Despite challenges, we continue to make progress. **Exhibit 0.0** shows the key milestones for the project since 2008 and they are considerable. Today, 422 miles of the full 500-mile system are environmentally cleared. Construction is well underway on the first 119-mile section in the Central Valley, which will initially serve as a test track for high-speed trains, and additional advanced design is proceeding on stations and the 52 miles of extensions into the downtown Merced and downtown Bakersfield.

This complex project, similar to other megaprojects in the United States and globally, faces many risks

– including high inflation and schedule and scope changes to address community and environmental requests – and all of these items have affected project costs and schedules. This Report describes the steps we are taking to continue addressing these project risks. However, the biggest risk we face is full funding – over which we have very little control. The Legislature's Peer Review Group has noted this many times, beginning in 2019, stating: "If the Legislature cannot ... provide a credible funding approach based on a commitment from the state, it is very difficult to see how the program can go forward successfully."

In the aftermath of the global COVID-19 pandemic, it is clear that significant additional federal funding is needed to complete the Merced to Bakersfield line. We are engaged with the U.S. Department of Transportation to forge a full federal partnership to complete this effort. If California is to avail itself of attractive federal financing programs and if the Authority is to deliver the voter-approved, 500-mile system connecting San Francisco to Los Angeles/Anaheim by high-speed rail, the state will need to consider a dedicated revenue stream for the project beyond 2030.

A significant amount of work lies ahead – our goals are to:

1. By the end of 2025, complete all environmental documents for the entire 500-mile system connecting San Francisco and Anaheim.
2. By 2028, complete and begin train testing on the first 119-mile, double-tracked and electrified high-speed rail test track between Madera and Poplar Avenue.
3. Between 2030 and 2033, begin high-speed passenger service between Merced, Fresno and Bakersfield – this is our highest priority.
4. By 2030, advance Northern and Southern California sections to 30% design so that construction can continue to progress if and when funding is provided.

These aggressive goals are worth striving for to achieve the mobility, environmental and economic benefits of California high-speed rail. They can only be achieved with a full funding partnership with the federal government and state funding stabilized beyond 2030.

KEY UPDATES, ISSUES AND RISKS

This Report provides significant detail on the development and implementation of the high-speed rail program. Below are the key highlights in this Report.

Schedule

Our schedule to complete the current 119-mile Central Valley Segment has been extended. Over the last two years, we have worked with our contractors to finalize design, complete change orders and settle long standing commercial issues dating back eight years. This detailed effort culminated in new, risk-based baseline schedules for our three

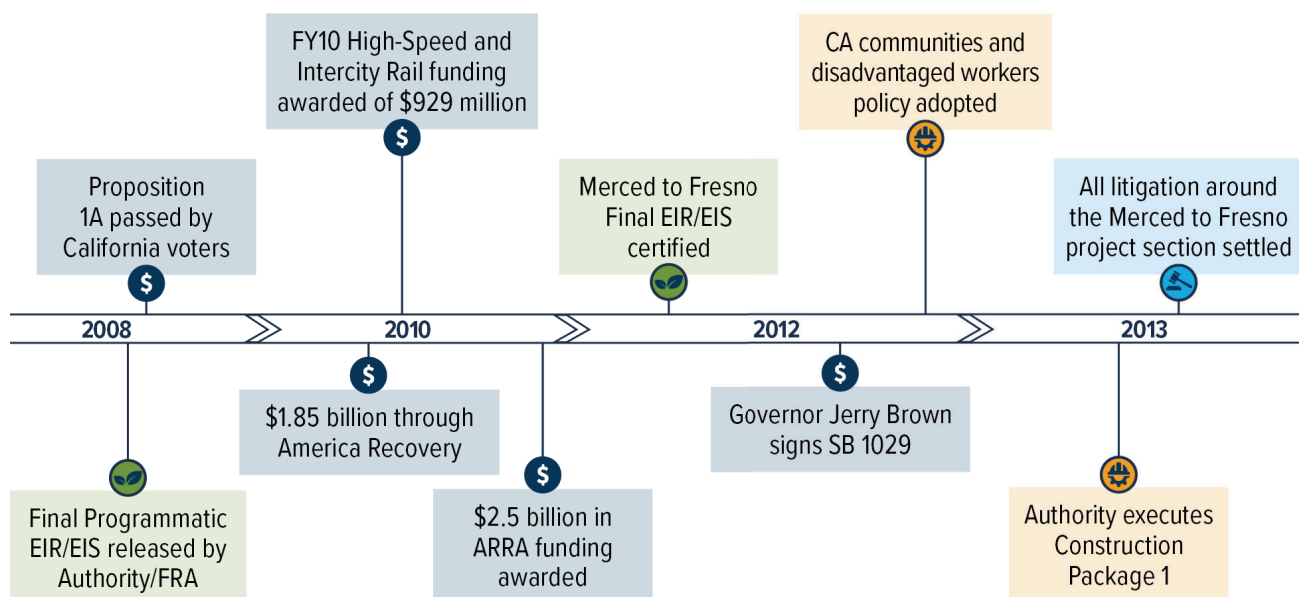
construction packages, which were presented to the Board of Directors in November 2022. These new dates were also incorporated into an ARRA grant amendment to align with Federal Railroad Administration (FRA) expectations:

- Summer 2023 - Construction Package 4;
- 2026 - Construction Package 1; and
- 2026 - Construction Package 2-3.

In 2022, the Legislature appropriated our remaining Proposition 1A funds and directed that the Merced to Bakersfield line should be our highest priority. With that, we have established an aggressive goal to initiate service by the end of 2030; our risk analysis suggests a forecast envelope of between 2030 and 2033. As we advance the Merced to Bakersfield line, we will evaluate options for the earliest possible service even while construction concludes, as outlined in our FRA ARRA Grant Agreement.

KEY ACCOMPLISHMENTS

Exhibit 0.0: Key Accomplishments



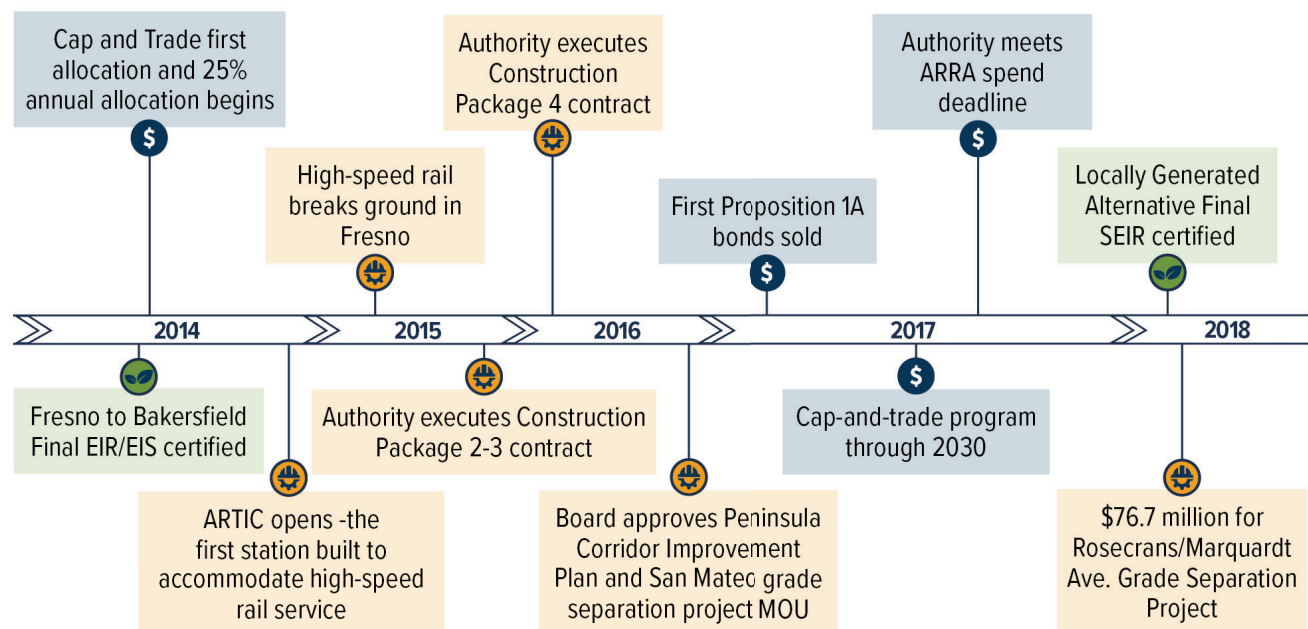
Capital Cost Estimates

Consistent with fiscal impacts felt around the world, our capital cost estimates have increased. Also, they have been revised to reflect the impact of inflation, escalation, expanded scope definition and greater contingency for achieving a risk-based estimate that meets FRA guidance. This new estimate no longer represents a “single-track” phased implementation approach to delivering the Merced to Bakersfield project – it includes double-track and fully built out facilities including stations and maintenance facilities rather than phasing them in. Compared to the 2022 Business Plan, the updated estimate has increased by between \$6.5 billion to \$9.7 billion. The elements that make up this revised cost estimate are inflation/escalation, enhanced scope definition and greater contingency for risk. Other factors have driven our estimates higher, which are described in Chapter 3. Key among them is that current construction has been extended by two years, combined with record high inflation, supply chain issues

and other market forces. As we advance design, we will refine our estimates through value engineering, applying global best practices and identifying cost-effective delivery strategies with an eye toward managing risks and costs prior to construction.

Funding

In 2022, California policymakers affirmed their continued commitment to delivering the nation’s first high-speed rail system with the appropriation of the remaining \$4.2 billion in Proposition 1A funds. Together with previously appropriated Proposition 1A, Cap-and-Trade, and awarded federal grant funds, we will deliver the existing program commitments to environmentally clear the 500-mile alignment from San Francisco to Los Angeles/Anaheim, the Central Valley Segment Funding Plan scope on the 119-mile segment between Madera and Poplar Avenue, and bookend projects in the Bay Area and Southern California. However, to deliver the balance of the Merced to Bakersfield early operating segment,

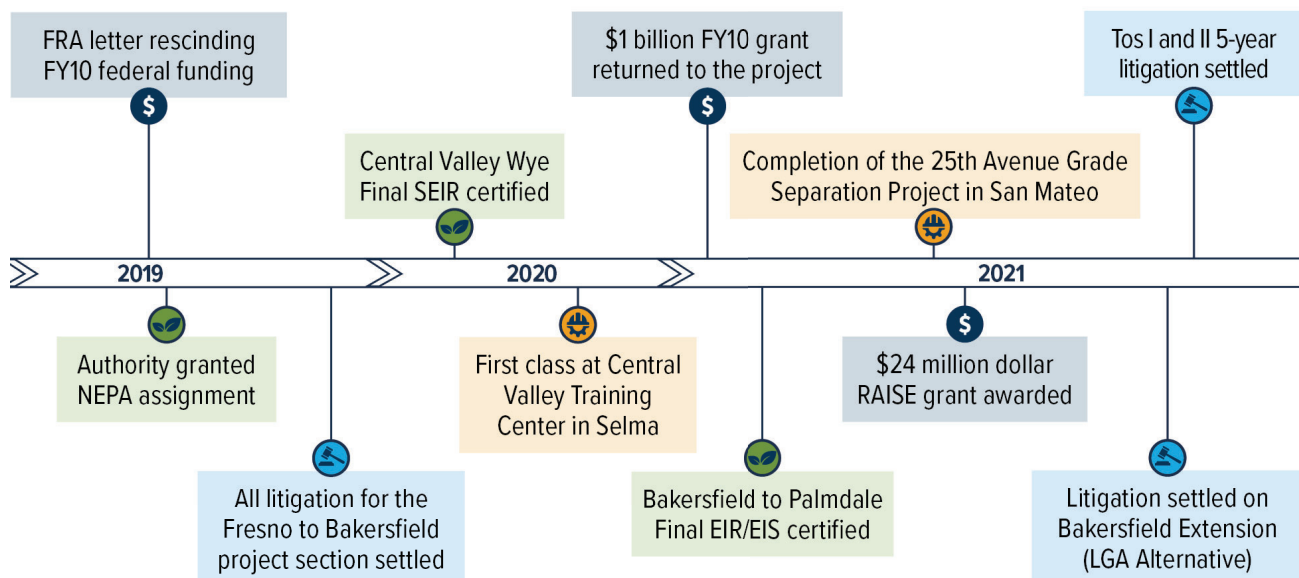


securing large new federal grants is a necessary and critical step. The California high-speed rail program is uniquely positioned to immediately deploy new federal funding investments, that will supplement current state funds, toward the delivery of the initial high-speed rail line between Merced and Bakersfield and to advance design on crucial segments in both Northern and Southern California. We have submitted three grant applications, pending federal decisions, and plan to submit multiple federal grant applications over the duration of the 5-year Bipartisan Infrastructure Law (BIL) program with a total award target of around \$8.0 billion. In consultation with the Federal Railroad Administration, and in light of the updated cost estimates, we are proposing to construct the Merced to Bakersfield line in phases as federal funds are awarded. Connections to the Bay Area and Southern California remain unfunded. If policymakers choose to deliver high-speed rail beyond the Central Valley, funding commitments for high-speed rail will have to be permanent and substantial at both the federal and state level, as was the case starting in the 1950s for highways.

Ridership Forecasts

Together with the California State Transportation Agency and Caltrans, the Authority has developed a new ridership forecasting model. This allows us to optimize how high-speed rail service integrates with state/regional rail and transit services. Our first step was to use the new model to prepare a new ridership forecast for the Merced to Bakersfield corridor. The new model incorporates revised population and employment growth forecasts, which have flattened significantly over the last decade. This, along with changes in travel behavior from COVID-19, has caused transit ridership among all California transit agencies to be down.

However, updated ridership forecasts still show that high-speed rail in the Merced to Bakersfield segment will nearly double current rail ridership, despite the lower population and employment growth forecasts. While growth forecasts have flattened our ridership projection by 25 percent (2030 forecast),



compared to the last update, the dramatic travel time improvements (cutting travel times in half) and rail-to-rail connectivity we are creating still yields significant ridership increases.

Improvements are even more dramatic for the full 500-mile system at 31.3 million riders (2040), which is two and a half times the pre-pandemic 12.5 million riders served on the Northeast Corridor's intercity service in 2019. This shows that the system, as originally proposed to the voters, still yields significant mobility benefits and reduced greenhouse gas emissions. Our next step is to continue working with our partners to refine the integrated service plan, modernize fare policies, and execute necessary agreements to incorporate into future ridership forecasting refinements.

STAYING FOCUSED ON OUR OBJECTIVES

As we work to deliver this project, we remain focused on our three fundamental objectives:

1. Expand economic development and economic opportunity;
2. Meet the state's environmental objectives – particularly the reduction of greenhouse gas emissions; and
3. Improve mobility for all our citizens.

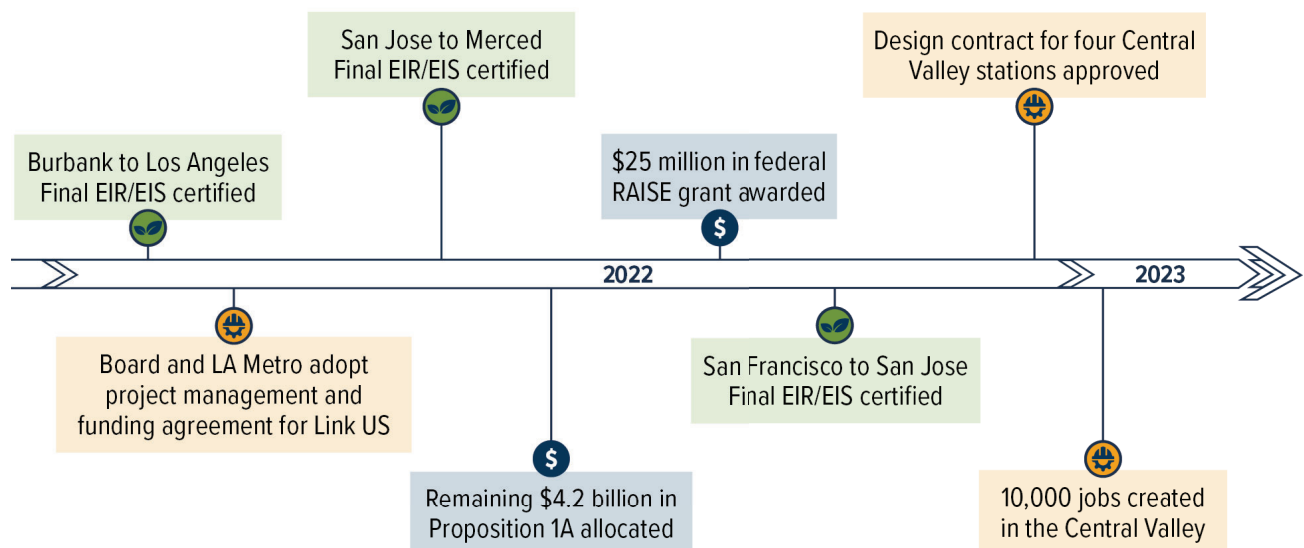


Exhibit 1.0: Merced to Bakersfield Corridor

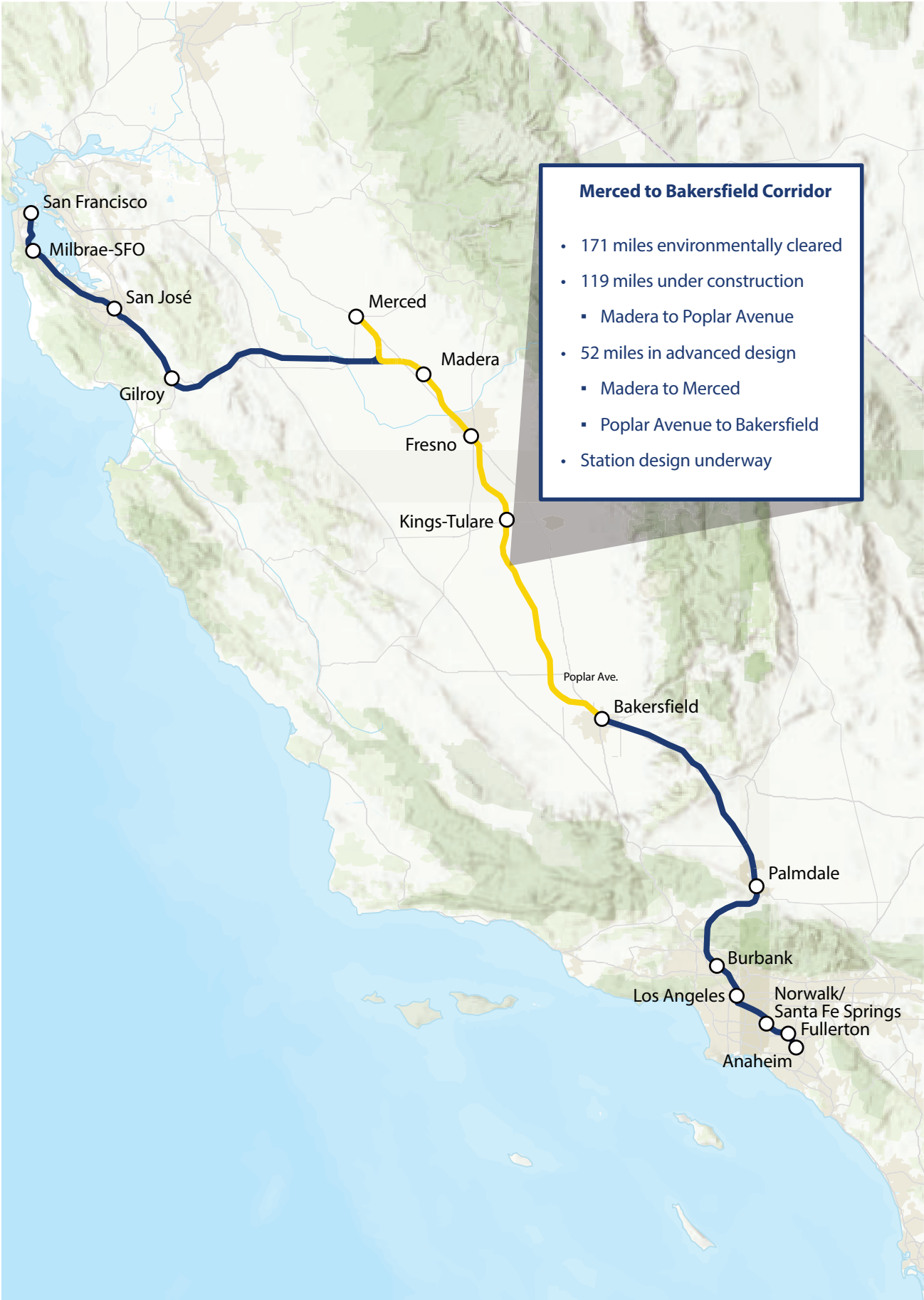




Photo: San Joaquin River Viaduct

Chapter 1: Steps to Getting Trains Running in California

INTRODUCTION

In 2018, the Authority first proposed the concept of developing an initial electrified high-speed rail line in the Central Valley between Merced and Bakersfield as the first building block of the full 500-mile system. In June 2022, Governor Gavin Newsom and the State Legislature agreed to appropriate the remaining \$4.2 billion in voter-approved Proposition 1A funds to develop and advance the Merced to Bakersfield line as shown on [Exhibit 1.0](#). In approving this funding, the Legislature and the Governor agreed that delivering electrified high-speed passenger service in this corridor is our highest priority, as defined in statutory provisions of Senate Bill (SB) 198. This included targeting any new federal funds secured through the Bipartisan Infrastructure Law (BIL) necessary for completion of this corridor, and the project as a whole.

We are making solid progress in delivering the project. However, like other megaprojects nationally and internationally, we have been impacted by record high inflation and supply chain issues from the COVID-19 pandemic. And, like other projects, this has affected our schedules and our costs. Our cost estimates have been revised to reflect:

- The impact of higher inflation plus escalation due to extended schedules;
- Expanded scope based on shifting away from the “single track” phased approach to one that includes double-tracking and fully built out stations and operating facilities (incorporating input from stakeholders and the Legislature);
- Higher contingency reflecting a 65% probability of delivering the project within our cost estimate, consistent with federal guidance; and
- Continued agreements with the Legislature, cities and counties and other stakeholders.

We previously estimated that to complete the remaining environmental work statewide, fund bookend projects in the Bay Area and Los Angeles, and build a double-tracked, electrified high-speed service connecting Merced, Fresno and Bakersfield would cost about \$25.7 billion. Our revised estimates now show a range between \$32.1 billion to \$35.3 billion. The primary drivers of these higher estimates include:

- Refined scope definition: \$3.9 billion – 40%;
- Added contingency for risk / other: \$3.7 billion – 39%; and
- Inflation and escalation: \$2.1 billion – 21%.

Our total available and forecasted funding through 2030 ranges from \$23.5 billion to \$25.2 billion (the high end of the range is based on the Legislative Analyst’s Office Cap-and-Trade projections). This is sufficient to complete the work we have committed to with our regional stakeholders and federal partner, including the 119 miles of construction in the Central Valley. This is our first and highest priority. We are committed to meeting our obligations to our federal and local partners first. However, in our conversations with the Federal Railroad Administration, it is agreed that the preferred operating segment be Merced to Bakersfield. We have developed a phased strategy and shared it with our federal partner.

However, it is clear that additional funding will be necessary to deliver the longer operational Merced to Bakersfield system for passenger service. The federal Bipartisan Infrastructure Law (BIL) makes significant funding available for projects like this, and we will continue our aggressive pursuit of federal funds to advance work on the project with the Administration’s support. We identified a goal of receiving about \$8.0 billion from the BIL over the next 5 years, and that remains our objective. More details on our cost changes, current and projected funding and our grants strategy are in Chapter 3 – Funding and Costs.

We have established an ambitious goal to begin operations by the end of 2030. Based on Federal Railroad Administration (FRA) guidance, we are adding a 25% schedule contingency – creating a “schedule envelope” of 2030 to 2033.

We will deploy several strategies to mitigate risk for cost and schedule pressures by:

- Refining design work prior to construction contracts being executed to have clearer project scope;
- Utilizing strategic procurement packaging options to create greater competition;
- Applying lessons learned from Central Valley construction;
- Working with partner agencies and the State on funding for the future multimodal station in downtown Merced; and
- Developing innovative options for rolling stock (trains).

We are concentrating our efforts and resources on the goal of delivering electrified high-speed rail service in this first segment between 2030 and 2033. Our first priority is to fulfill our federal grant commitment to complete the 119 miles of high-speed rail infrastructure between Madera and Poplar Avenue, to finish environmental clearance on the full 500-mile system and fulfill our regional bookend funding commitments. Achieving the goal of delivering the Merced to Bakersfield project requires additional funding. With funding secured, delivering it will involve many complex decisions and steps, including completing 171 miles of guideway, installing track and systems, procuring the nation’s first high-speed trains, and building stations, maintenance and energy facilities.

In collaboration with our partners, we will design, fund and build a new multimodal station in downtown Merced where high-speed trains will connect with Altamont Corridor Express (ACE) and San Joaquin regional rail services to expand connections between the Central Valley, the Bay Area and other

Northern California destinations. A new station in downtown Bakersfield, with bus connections into the Los Angeles Basin, will serve as an interim southern terminus until the line can be extended farther south. High-speed trains will travel along the Merced to Bakersfield corridor in their own, exclusive grade-separated right-of-way unimpeded by other freight or passenger train traffic. Eighteen trains per day will provide two-way hourly service between Merced and Bakersfield and will reduce passenger trip time by more than an hour and a half. Connecting bus services at the Fresno and Kings/Tulare stations will provide important transit connections toward the Central Coast or inland destinations, including Yosemite and Visalia.

This chapter presents an initial roadmap of the steps we will take to make high-speed rail operational in

California as soon as possible. It explains where we are now and where we want to be by the end of the decade. It discusses the capital elements that we will design, build, test and commission before starting service.

“We stand here shoulder to shoulder with the California High-Speed Rail Authority, with California, with Governor Newsom and the California Department of Transportation to deliver this project.”

– Amit Bose, Administrator,
Federal Railroad Administration



Photo: FRA Administrator Amit Bose meets with high-speed rail crews at the Cedar Viaduct.

Exhibit 1.1: Comparison of Madera vs. Merced Termini

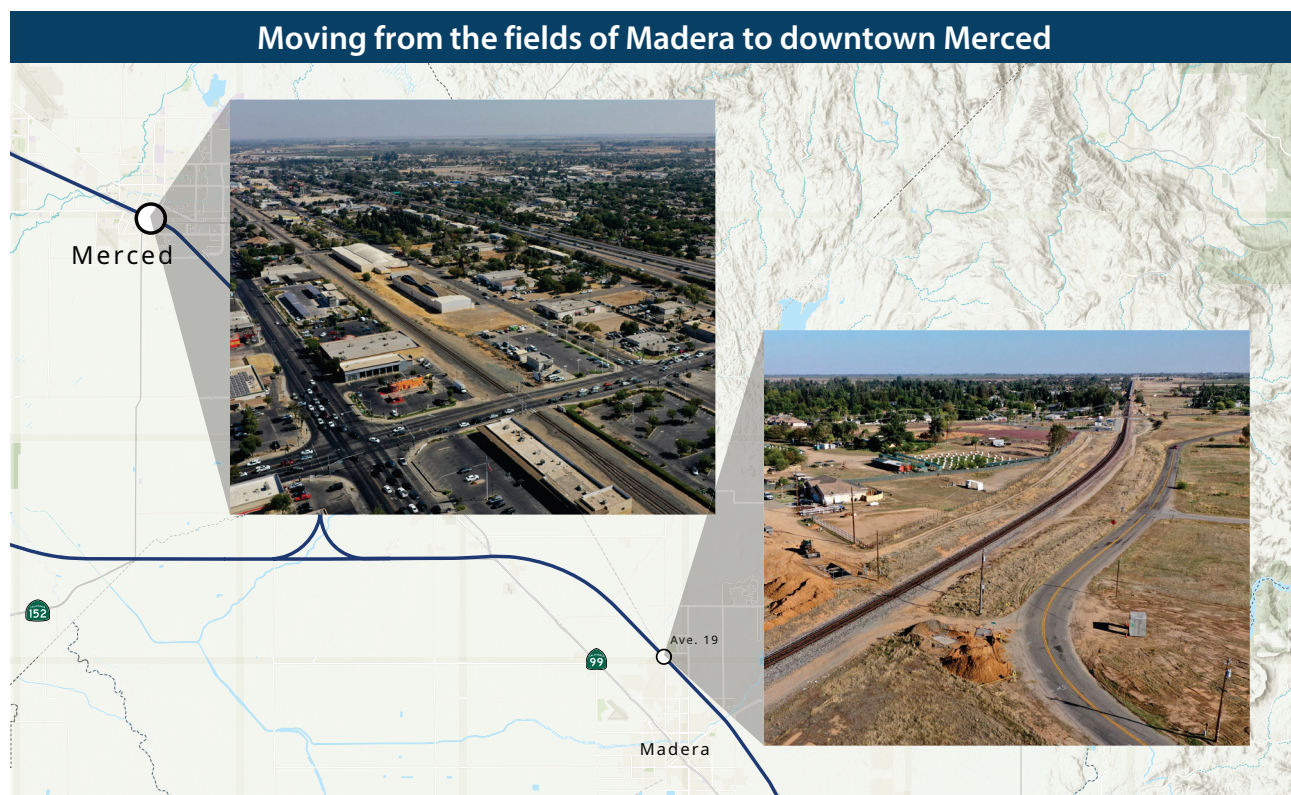


Exhibit 1.2: Comparison of Poplar Avenue vs. Bakersfield Termini



Why the Merced – Bakersfield Corridor Makes Sense

The Central Valley is home to approximately 6 million residents and is becoming more prominent as the state's third regional economic engine. The 171-mile Merced to Bakersfield high-speed rail corridor will travel through this fast-growing region and provide links to Northern and Southern California population and economic centers. The Authority is already making a significant capital infrastructure investment in the Valley, with the first 119-mile high-speed rail segment under construction. The northern terminus of the initial construction, at Madera, and the southern terminus, north of Bakersfield at Poplar Avenue, are both remote locations that don't effectively connect with the rest of the statewide rail network. Regional partners and the Legislature agree that extending the line north into downtown Merced and south into downtown Bakersfield will provide new and growing businesses, colleges and universities, medical centers and residents connections to other passenger rail and bus services to points north and south beyond the Central Valley.

Exhibits 1.1 and **1.2** illustrate this choice.

Building upon the 119 miles of high-speed infrastructure assets currently in construction and putting them into service in this 171-mile corridor will bring significant economic, mobility, climate and air quality benefits to California:

- **Economic** – In the short term, ongoing construction is projected to produce nearly 200,000 job-years of employment in the Merced to Bakersfield corridor and over \$41 billion in economic activity. In the long-term it will create direct and indirect jobs that will permanently transform the region;
- **Mobility** – Faster, more frequent and more reliable passenger rail service and enhanced connections will contribute to significantly higher ridership in the corridor, with 6.6 million projected annual system-wide riders in 2030;
- **Climate** – Electrified, zero emission trains running on on-site renewable resources will reduce greenhouse gas emissions (CO₂e) approximately to 32,720 metric tons by 2030; and
- **Air quality** – Central Valley air quality will be improved by reducing 183 million annual Vehicle Miles Traveled through higher ridership systemwide and by reducing vehicle emissions and congestion by shifting travel from gas and diesel to electric high-speed trains.

Developing the high-speed corridor between Merced and Bakersfield will lay the foundation for the full 500-mile system that will carry people between San Francisco and Anaheim and yield even greater economic, mobility and environmental benefits.

Exhibit 1.3: Staged Project Delivery

Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 6	Stage 7
Project Initiation	Identify Preferred Alternative & Begin Preliminary Design	Environmental Clearance, Prepare for Pre-Construction	Early Works and Right-of-Way	Procurement for Construction	Construction, Testing and Commissioning	Project Close Out
Define initial scope, cost and schedule	15% Preliminary Engineering	30% Preliminary Engineering	Right-of-Way acquisition	Request for Qualifications/Proposals	Construction initiated	Transfer completed project from contractor to Authority
Initial scope evaluated in programmatic environmental impact statement	Draft Environmental Impact Report/Statement (EIR/EIS)	Final EIR/EIS	Third party agreements - railroads, local jurisdictions, utilities	Select contractor/award contract	Change order management	Detailed project documentation complete
Identify risks	Evaluate range of alternatives	Record of Decision - Environmental Clearance	Environmental permits - federal agencies	Issue Notice to Proceed	Construction completed	
	Identify Preferred Alternative	Risk assessment	Risk assessment	Finalize right-of-way, third party agreements, permits and environmental mitigation	Project tested & commissioned	
	Risk assessment	Develop Procurement/Delivery Plan			Substantial completion milestone	
		Right-of-Way Mapping			Ready for track and systems	
		Identify Utility Relocations				

Stakeholder and Community Engagement

Reducing GHG Emissions

California high-speed rail is a core part of California's mandated goals to achieve carbon neutrality by 2045 while decarbonizing the transportation sector by 2035. Most importantly, as a new piece of infrastructure, intended to last for the next century, the system is being built to adapt to heat increases, sea level rise and flooding, precipitation, and wildfire events. We are also engaging with station communities to understand the role these facilities can play in reinforcing community resilience.

According to the US Environmental Protection Agency, almost a third of the greenhouse gas emissions generated in the United States come from the transportation sector, primarily from burning fossil fuel for cars, trucks, ships, trains and planes. The high-speed rail system is integral to achieving carbon neutral objectives because the system directly addresses these trips.

The project cost-effectively provides the capacity to shift tens of billions of vehicle miles and air trips. The 102 million metric tons of emissions reductions currently forecast for the first 50 years are just a fraction of possible emissions reductions associated with travelers using high-speed rail. For example, global experience demonstrates that high-speed rail can supplant vehicle and air modes of travel in corridors it serves.

DELIVERING THE MERCED TO BAKERSFIELD CAPITAL PROGRAM

This section describes the capital elements that comprise the Merced to Bakersfield corridor infrastructure program – including the guideway, trains, track and systems, stations and operations facilities.

Exhibit 1.4 (on the following pages) shows the timeline for how the Authority anticipates sequencing each element to deliver a high-speed rail corridor for passenger service.

Design work of the civil infrastructure is complete, and construction is advanced on the 119-mile segment between Madera and Poplar Avenue. Advanced design has started on the extensions to Merced and Bakersfield, and the Authority has started to design the four new high-speed rail stations located in Merced, Fresno, Kings/Tulare and Bakersfield.

As we advance each element of the program, we apply the lessons learned to date and follow the structured and rigorous approach to project development and delivery embodied in our Staged Project Delivery process. We report our progress and status to the Authority's Board of Directors on a monthly basis and in our business plans, project update reports and other reports. Our Staged Project Delivery process also creates a framework for more structured decisions at key project milestones. This process, illustrated in **Exhibit 1.3**, shows the general sequence of phases that the Authority is following. This particular example illustrates a design-build project delivery approach. However, the Authority

will systematically evaluate all potential delivery methods for each specific project, including, for example, design-bid-build. These evaluations will be conducted through a newly established Project Delivery Decision Committee, which is described in more detail in the Merced and Bakersfield Extensions section.

Completing Construction - Madera to Poplar Avenue

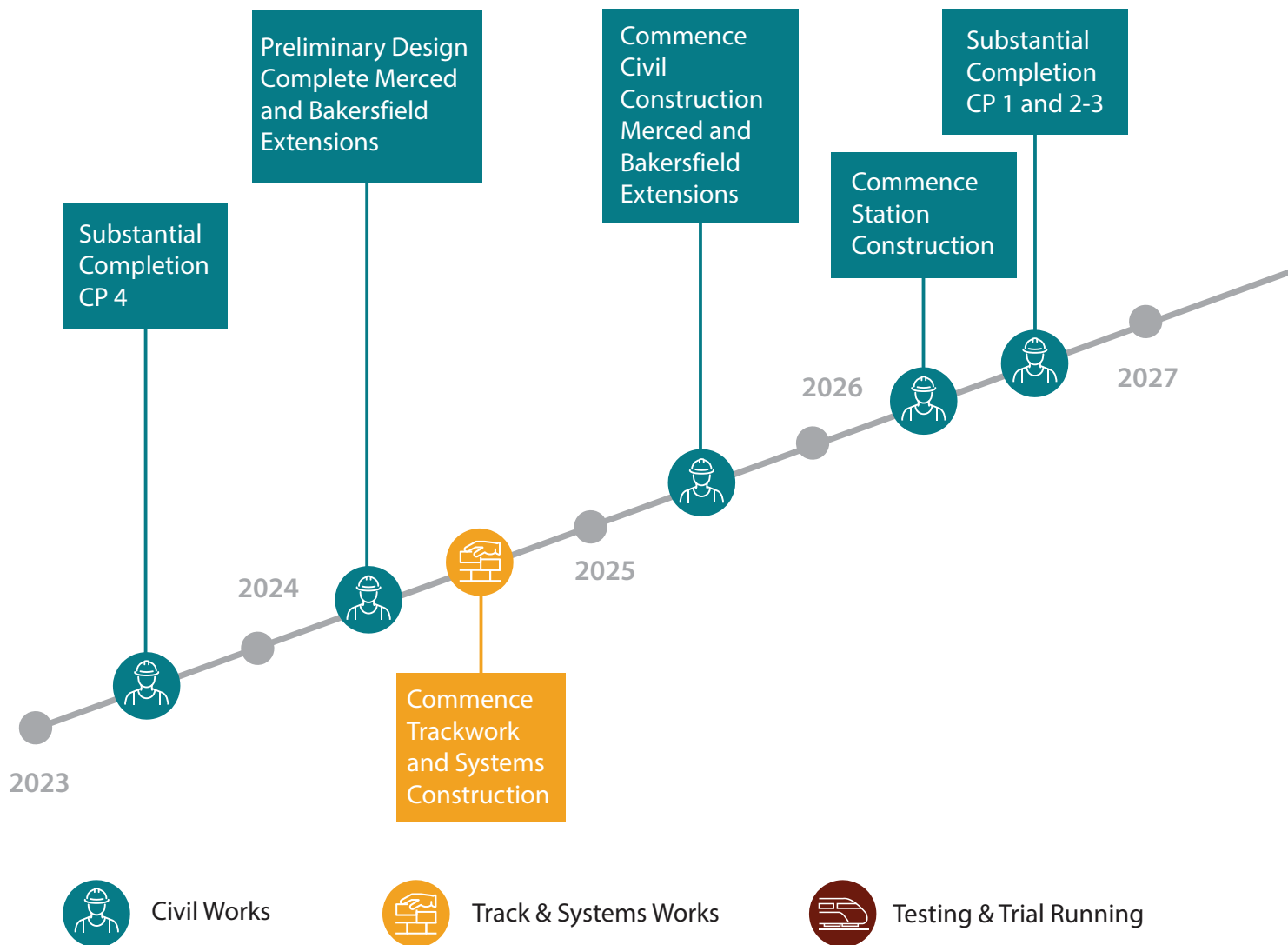
Completing this segment and fulfilling our federal grant requirements associated with it is our highest priority. Since joining the Authority in 2018, Chief Executive Officer Brian Kelly and senior management have been striving to gain better project definition given the number of significant change orders that had to be resolved. These change orders are largely the byproduct of commencing construction at risk. Specifically, we started construction before the requisite pre-construction activities – including right-of-way acquisition, utility relocations, and project design elements – were complete. As of now, the most significant outstanding change orders are resolved, resulting in better clarity on the schedule for substantial completion of the construction packages. We are now advancing the program following our Staged Project Delivery Program.

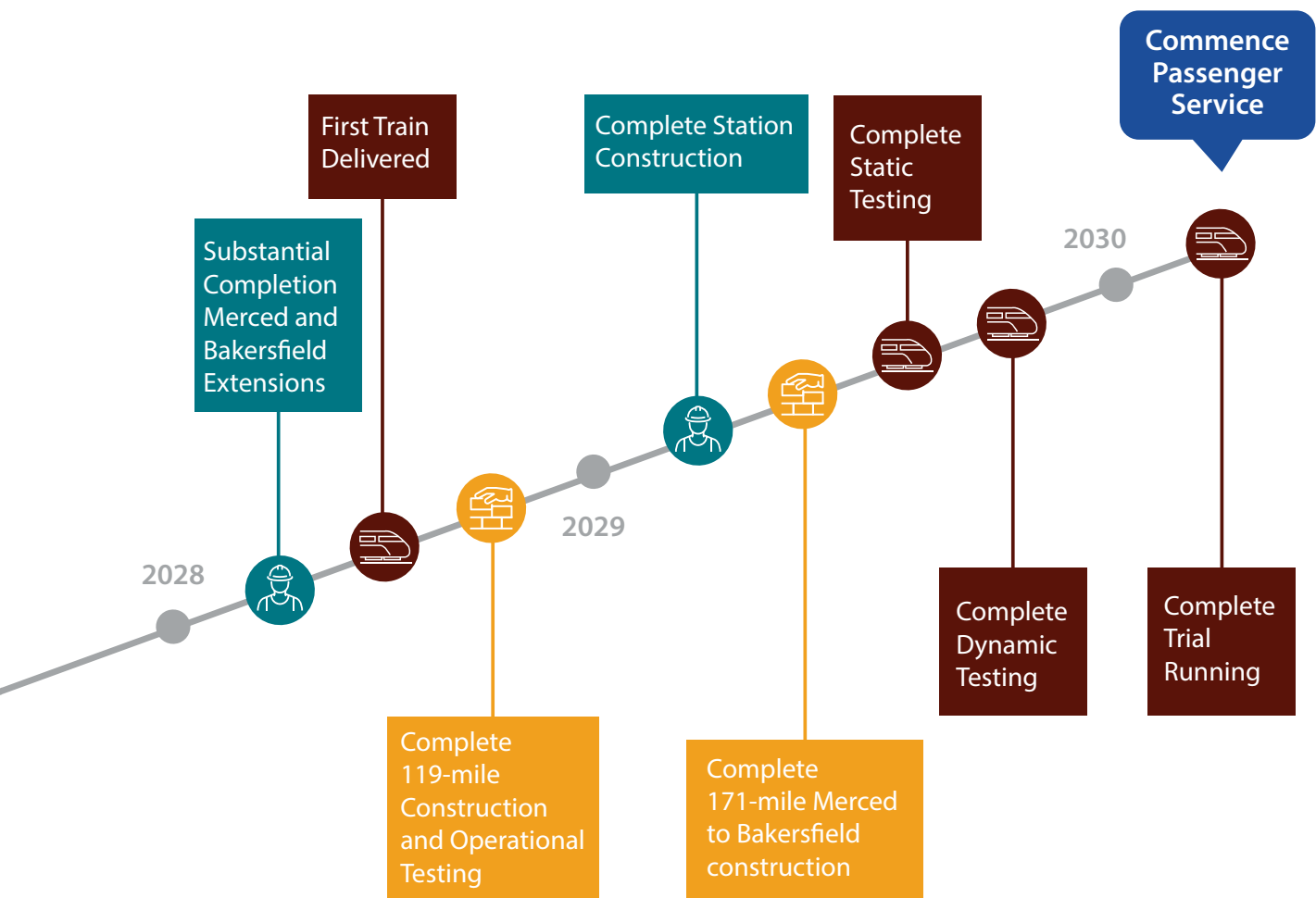
Exhibit 1.4: Timeline to Complete Merced to Bakersfield

This timeline shows the major milestones that lie ahead to deliver the 171-mile electrified high-speed rail system linking Merced, Fresno and Bakersfield and providing connections to rail and transit systems in Northern and Southern California. The entire corridor has been environmentally cleared and construction on the first 119 miles between Madera and Poplar Avenue (north of Bakersfield) is well underway. This first segment is being constructed through three design-build construction packages (CP 1, CP 2-3, and CP 4), with CP 4 scheduled for completion summer 2023. Design of the high-speed rail stations has begun as well as advanced design of extensions to Merced and Bakersfield.

Our goal is to complete the infrastructure, lay track, install operating systems, build stations and operations facilities, procure trains, and complete testing to begin passenger service as soon as possible. This is an ambitious schedule and considerable work lies ahead.

The project is advancing in partnership with the California State Transportation Agency, the Federal Railroad Administration, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission and the California Department of Transportation along with extensive engagement with communities, stakeholders and regulatory agencies. This work and these steps are described in this Chapter and Chapter 2.





Years of work culminated at the November 2022 meeting of the Board of Directors, in which the CEO presented Revised Baseline Schedules for Construction Package 1 (2026), Construction Package 2-3 (2026) and Construction Package 4 (Summer 2023). In addition, the Authority and the Federal Railroad Administration executed an amendment to our American Recovery and Reinvestment Act grant agreement aligning the Authority's current schedule with the FRA's expectations.

This effort has involved:

- Challenging negotiations with contractors related to major outstanding scope changes and getting the scope into the contracts during a period of historically high inflation, supply chain interruptions and the re-opening of economies from the global pandemic;
- Months of analysis of schedule and cost impacts; and
- Extensive risk analyses.

Ultimately, this provides more clarity on the timeline to completion than before. There are risks that remain and the path to completion remains challenging, but the projects are now substantially defined, right-of-way acquisitions are 96% complete, design packages are done and the majority of necessary utility relocations are also done. The Authority is focused on managing and executing our plan.

Merced and Bakersfield Extensions

In August 2022, the Authority Board of Directors approved two contracts to advance design into Merced and Bakersfield and prepare extensions for future construction. The Authority awarded the approximately 34-mile Madera to Merced extension design contract to Stantec Consulting Services Inc. and the approximately 18-mile extension from Poplar Avenue to Bakersfield contract to HNTB. To support this effort, the Authority received a \$25

million federal Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant, covering over half of the initial \$41 million design costs for the Merced Extension. The design contracts will allow the Authority to finalize the project configuration footprint (a minimum of 30% design). This will also advance detailed design to meet local planning needs, map right-of-way acquisition and utility relocation requirements, and update capital cost estimates over the next two years.

The Authority projects that draft configured footprints will be completed by late 2023, providing adequate certainty to allow for an early start on right-of-way acquisition to support the planned construction packages, even as the configured footprint goes through final checks and governance reviews.

Because these northern and southern project sections have been environmentally cleared, crews have already started geotechnical work to help the Authority with needed information on the foundations necessary to support high-speed rail infrastructure.

The Authority has also entered into several community improvement agreements within the Merced Extension to minimize environmental justice impacts from construction, including agreements with the:

- City of Chowchilla: Sewer and wastewater treatment plant connection into the community of Fairmead;
- Fairmead Community and Friends: Roadway improvements, sidewalk and streetlight installations;
- County of Madera: Community center facility and water supply improvements for Fairmead;
- City of Madera: City-specific concerns, including emergency lighting during construction; and
- Chowchilla Elementary School District: Assist with school bus routing.

What Is a Configuration Footprint?

Consistent with the Authority's Staged Project Delivery Process, a project's footprint is "configured" at the end of Stage 3. During Stage 3, geotechnical investigations are conducted, designs are advanced and scopes are defined at increasingly specific levels of three-dimensional detail. Specifically, guideway will be defined by its width and geographic boundaries and by its vertical characteristics (i.e., whether sections will be elevated on structure, on the ground or in a trench or tunnel). Completing this process allows the Authority to:

- Map the initial right of way necessary to construct a project;
- Identify utility relocation requirements;
- Develop third-party agreements; and
- Initiate requests for environmental permits.

These elements are configured concurrently, allowing cost estimates to be refined, risk and benefits to be assessed, and procurement/project delivery decisions to be made. Once a project is configured, any proposed changes must be evaluated through an integrated, multi-disciplinary review and approval process. Completing this step sets a project up for advancing to the next stage, where designs are finalized and pre-construction activities are conducted.

As the design work progresses, the Authority, in keeping with its Staged Project Delivery process, will also research and explore alternative construction delivery methods prior to the final design phase. This will include approaches such as design-bid-build, construction manager/general contractor (CMGC), progressive design build or other delivery methods, in addition to the design-build approach. We will build on the lessons learned from our initial construction to consider what construction method best fits the requirements for each extension, and staff will take options and recommendations to the Board of Directors. The timing for specific activities to commence on the Merced and Bakersfield extensions after the configuration footprint is achieved will be coordinated with the timing of federal grants or other support to advance these extensions.

Through the Staged Project Delivery Process, we identified a need to augment the Authority's governance process by establishing a Project Delivery Decision Committee. This director-level committee provides oversight on scope, cost, and schedule recommendations and formally evaluates the most appropriate delivery methods for each project. The committee also reviews major project decisions, including the best delivery strategy to meet the Authority's system goals while minimizing future contract delivery cost and schedule risks.

The Project Delivery Decision Committee provides comprehensive information to fully inform the Authority's Program Delivery Committee (PDC), Business Oversight Committee (BOC), Enterprise Risk Committee and Executive Committee as they make contracting recommendations to the Chief Executive Officer and the Authority's Board of Directors.



Photo: Anaheim Regional Transportation Intermodal Center Station

High-Speed Rail Stations

The nation's first high-speed rail stations are a vital step for starting passenger service by the end of the decade. Stations are a critical element of any high-speed rail system, enabling passenger access to the system and connections to other services, as shown in [Exhibit 1.5](#). The Authority has long-established performance criteria for the stations, including that they be easy to maintain, are universally accessible, seamlessly integrate a range of transportation modes (including buses, bicycles, pedestrian pathways, other rail systems and automobiles) and feature design characteristics that make them readily identifiable as high-speed rail stations. Their sustainability performance is also a requirement and a part of minimizing operations costs through design that maximizes natural ventilation, achieves zero-net energy performance through onsite energy generation, and maximizes the efficient use and reuse of water resources.

Station Design

In October 2022, the Board approved awarding a contract and executing the first notice to proceed to a joint venture (JV) of Foster and Partners and Arup. The JV leads an extensive team of small businesses that will develop the final designs for the four Central Valley stations. The station designer will work with the Authority to ensure that station delivery meets the high expectations of the first high-speed rail stations in the United States.

Work is underway on the advance planning and access work at the stations so that they are integrated into the locally planned land uses. The team will advance one design to confirm all the functional elements that will come together in a signature station at each location.

EXHIBIT 1.5: Station Elements

These elements include:

- Station:
 - ▶ Platforms;
 - ▶ Canopies;
 - ▶ Vertical circulation and concourse; and
 - ▶ Functional and operations spaces, including crew space.
- Site:
 - ▶ Parking (ADA, bike, automobile);
 - ▶ Transit facilities (bus stops);
 - ▶ Passenger pick-up and drop-off; and
 - ▶ Station access, particularly roadways.

Initial design work is focusing on elements necessary to define the station site and the physical extent of the station footprint. This will be used to define any right of way that may be necessary beyond the footprint identified in the environmental Records of Decision. In addition, utility requirements will be identified and materials for station

components will be selected and refined. Through the process, the designer will refine cost estimates and conduct value engineering exercises to assess budget requirements. This first phase of work will advance through mid-2025 followed by final design. Construction is anticipated to begin in 2026.

Consistent with the Authority's staged delivery process, some station components will be scaled to accommodate variable ridership levels. Our objective is to appropriately scale initial station construction to accommodate early ridership demand while planning to accommodate future ridership growth. Accordingly, the design team will advance design to configuration footprint on the ultimate design for all elements, including transit-oriented development layouts, future parking structures and other large-scale station requirements. This will help future proof those critical elements as everything necessary for day one of customer service is advanced through final design.



Rendering: Merced Station

Merced Station

In the 2022/2023 Budget, the Legislature identified the need for a central station in downtown Merced. The Authority agrees with the desire to move the station from its original, environmentally cleared at-grade location (between G Street and Martin Luther King Jr. Way) to a new location on an elevated structure (between O Street and R Street) in downtown Merced. This new station location maximizes seamless multimodal opportunities, including rail-to-rail transfers between systems, which will more effectively serve passenger needs and generate higher ridership.

Stakeholder coordination meetings with various organizations, including the City of Merced, began during the initial development of the Station Area Plan that started in 2015. Ongoing coordination is expected as the City of Merced and the Authority finalize a funding agreement for the city to use as part of its general plan update. The focus will be on the station as a mobility hub.

Relocating the station required an environmental reexamination to evaluate the potential effects of moving it to the new site and to provide the

Authority with the required approvals to proceed with the new location. This process is expected to conclude in spring 2023.

The new proposed site will accommodate realigned San Joaquins rail service and the planned Altamont Corridor Express (ACE) Ceres-Merced rail extension in alignment with Merced's long-term planning and development strategy. The City of Merced, the California State Transportation Agency, the San Joaquin Joint Powers Authority (SJJPA) and the San Joaquin Regional Rail Commission envision coordinated intermodal operations with San Joaquins and ACE rail services as well as intercity and local bus services at downtown Merced.

Madera Station

The SJJPA, in coordination with local leaders, is in the process of relocating the existing Madera Station served by San Joaquins rail service to a location near Avenue 12 to better meet regional goals of improving ridership and connectivity. This relocation will allow connectivity with initial high-speed rail service.

Fresno Station

Throughout 2021 and 2022, the Authority worked in collaboration with an AmeriCorps CivicSpark Fellow to gather community input regarding early site activation projects that could be implemented around the future Fresno Station area. This involved conducting research at several local events in Fresno. Surveys, stakeholder interviews and one-on-one interactions informed the Authority of the community's wishes for what the future Fresno Station should include. Amenities for the station site include safe and well-traveled spaces for food vendors, bicycle repair stations and parking, shade structures for visitors, Wi-Fi access, public art installations, blue light emergency phone towers and sufficient lighting to ease safety concerns. This feedback will help ensure that residents' perspectives are incorporated into the final design of the future Fresno Station.

Kings/Tulare Station

The Kings/Tulare Station site has evolved since environmental clearance. The Authority, Kings County and the City of Hanford entered into an agreement on April 2, 2020, to resolve critical aspects of this station layout, including platform location. The revised station locates the platform access south of the San Joaquin Valley Railroad to maintain an interconnection with cross-valley rail. Access to the station will be focused on connecting to Lacey Boulevard via a roundabout at State Route 43. Lacey Boulevard directly connects the station site with downtown Hanford and will be the focus of city-led corridor land use planning. As station design advances in 2023, the Authority will work closely with city and county partners to detail designs that accommodate public access for all modes and emergency vehicles, as well as energy needs for the system and station.

In 2021, the Authority worked with local stakeholders to progress the Kings/Tulare Station site development on a vision for the station, including convenient transit connections between the station and surrounding communities. Important local connections include transit, bicycle and pedestrian

access between downtown Hanford and the station. Key regional connections include transit service between Visalia and other communities in Kings and Tulare counties. The long-term vision includes Cross Valley Corridor (CVC) rail service connecting communities along the corridor to high-speed rail with an at-grade station perpendicular to the Kings/Tulare Station.

Bakersfield Station

The station will be a regional hub, providing connections to and from neighboring communities. This is especially important as part of the early operating segment because the station will be the southern terminus of the high-speed rail line – with connecting buses to the Los Angeles region and other locations – until the system is extended further south.

The station site will provide space for various access modes, including pedestrians, bicycles, transit, drive-and-park and passenger pick-up/drop off. The primary vehicular access will be via the SR 204 and F Street interchange. Secondary vehicular access is planned from Chester Avenue. In addition, space on the station site will be needed for landscaping, retention ponds, solar panels, electric vehicle charging, plazas, roadway circulation and potential transit-oriented development.

The Authority worked with regional and local partners in 2021 and early 2022 to discuss a vision for the station, including convenient multimodal connections between the station and key destinations in Bakersfield and regional connections to other Kern County communities. Important local connections include pedestrian, bicycle and transit access to the station.

In July 2020, the Authority started preparing for the procurement of a station designer and to consider refinements to the conceptual site plan that would improve access to the site and better integrate it with the surrounding city. The station location improves pedestrian and bicycle access and allows streets around the station site to be more pedestrian, bicycle and development oriented.

Operational Elements and Trains

The Authority is undertaking a systematic review of its approach to procuring and delivering key operational capital elements, including track, systems, trains, and operations and maintenance facilities for the Merced to Bakersfield corridor.

In late 2019, the Authority initiated a procurement for a contractor to design, construct, install and maintain the track and systems for the high-speed rail system. The procurement was structured as a design-build-maintain contract that included design and construction of the trackwork, railway systems, electrification, and final testing and commissioning. It included a 30-year maintenance requirement for all civil works, as well as track and systems infrastructure. It was envisioned to be executed in phases as project elements were developed over time.

In March 2020, the global COVID-19 pandemic affected the progression and development of proposers’ responses to the procurement. In October 2022, due to the impacts to the economic climate, supply chains and 40-year high inflation, the Authority determined it was not in the State’s best interest to continue the procurement in its then-current form. This decision provided the opportunity to restructure the procurement to better respond to unstable and volatile supply and pricing in the current market.

The Authority is restructuring its procurement strategy to deliver track and systems as well as other key operational elements for the Merced to Bakersfield line. This includes evaluating how scope elements are bundled (or unbundled), alternative delivery methods and other related tasks to achieve our goal to begin operations in 2030. The strategy focuses on the following goals:

- Ability to achieve revenue service on the Merced to Bakersfield line in the revised 2030-2033 “schedule envelope”;
- Ability to begin work on completed civil assets, specifically the high-speed rail guideway;
- Establishing a competitive procurement environment;
- Alignment with the Authority’s capability, capacity, and ability to manage and mitigate integration and interface risks; and
- Provide flexibility to manage and adjust to future program development uncertainties.

Developing the revised procurement strategy involves three phases and is scheduled to be completed by April 2023, as shown in **Exhibit 1.6**. The first and second phases are complete. These included internal technical and commercial workshops to identify packaging and delivery alternatives and es-

Exhibit 1.6: Track and Systems Procurement Strategy



establish criteria to evaluate them. We also held multiple debrief sessions with companies that participated in the original Track and Systems procurement. These sessions allowed for candid discussions and feedback about the original procurement, including what worked well and what should be considered going forward.

General themes from these consultations included the fact that, during the Track and Systems procurement, there were significant market shifts within the rail supply industry as a result of the COVID-19 pandemic. In particular, the industry supply chain became stressed – a global phenomenon across multiple market sectors – which made it extremely hard for bidders to hold pricing constant across the multiple years of the multi-billion-dollar contract. Additionally, industry increasingly took the view that the proposed contract structure placed too much responsibility for integration risk on the contractor, particularly in areas that they did not have direct control over. The combination of these issues would have likely resulted in significant increases in bid prices to mitigate the risk and could have resulted in no bids being submitted.

Staff has evaluated scope packaging alternatives and delivery models that considered the lessons learned during the original process, current market conditions and alignment with the Authority's current and future capacity to manage and deliver the project while minimizing risk. During this phase, staff consulted with international high-speed rail experts to understand best practices and lessons learned from projects across the globe to inform the updated strategy.

Presently, as part of the third phase – market engagement – the Authority is evaluating its updated strategy and procurement options through open discussions with industry suppliers and contractors. Through these discussions, staff are testing, validating and refining the strategy options and approach, which includes consideration of multiple contract offerings. This engagement allows staff to identify fatal flaws and make refinements prior to taking a recommendation to the Board for consideration and the release of a future procurement or procurements. A comprehensive assessment of all operational elements – track, systems, maintenance facilities and trains – is being considered and includes assessing various procurement packaging of elements individually and/or together.

Staff is also collaborating with key stakeholders, including CalSTA, the San Joaquin Joint Powers Authority and the Federal Railroad Administration, on delivery model options. As these final steps are completed, draft procurement documents will be developed, updates to build internal organizational staffing for implementation will be identified, and other required activities for future procurement(s) will be initiated. The plan is to bring a recommended procurement option to the Authority Board for its consideration later this year (2023).

Energy Facilities to Power the System

The Authority is committed to operating the system on renewable energy – and the land we currently own along the early operating segment is a valuable asset for solar generation to support operations. We have initiated work on the conceptual design and financial modeling of a battery storage and solar generation project. The battery energy storage system, and solar photovoltaics at each of the traction power substations on the Merced to Bakersfield corridor, will be sized to offset the annual load from the operation of the high-speed trains in the corridor.

The Authority has been actively coordinating transmission upgrades at the interconnection points with PG&E. In addition to the grid benefit of those improvements, it will also have the following added benefits by:

- Significantly reducing peak energy demand;
- Significantly reducing the intermittent high-speed rail system's demand on the transmission grid;
- Smoothing the demand of high-speed rail system interconnects with the transmission grid; and
- Reducing how much demand is placed on the transmission system overall.

The Authority's storage and solar resources will supply capacity to the state's grid during times when demand for power is at its highest. These resources comply with the California Independent System Operator (ISO), the operator of the state's electrical grid, requirements. This solar and battery strategy will provide greater operating cost certainty. The ability to reduce peak demand charges by drawing on a battery, rather than the grid, is crucial for reducing overall electricity charges.

The batteries also provide critical resilience. Access to the utility system could be interrupted and pose some risk, as has been seen during heat waves that affects demand on the electricity supply. Solar

generation, paired with batteries, mitigates that risk and enables the operator to keep the trains running for more than half a day, in the worst-case scenario, or to run an emergency schedule continuously – maintaining passenger service, as well as a positive reputation for reliability.

These renewable energy and storage resources allow the Authority to meet its policy goal set by the Board of Directors, which, in 2008, committed to run the system entirely on renewable energy. They also anticipate the need to comply with SB 1020, the Clean Energy, Jobs and Affordability Act of 2022, that commits the state to running its operations on clean, renewable energy resources by 2035, as well as SB 1203 that requires the state to achieve net-zero operations for all agencies.

The Authority is refining the sizing and location of these resources as well as analyzing procurement options, costs and potential new sources of funding that have emerged from recent federal legislation. A procurement strategy will be finalized in 2023, with project delivery activities timed to have the resources ready for the testing and commissioning phases. Coordination with the Public Utilities Commission, PG&E and the ISO will be critical to aligning regulatory and tariff items for successful implementation.

Trains and Maintenance Facilities

The Authority is evaluating its strategy for procuring trains as part of its comprehensive procurement review. Preliminary high-speed rail train performance specifications have been developed and initial public outreach on interior design for the trains has been conducted to seek input on key design preferences of the interior layout of the trains. As shown here, artist renderings were developed based on the preferred designs discussed with participants.

In 2023, the Authority will build off this initial work and initiate the train interior design process. The high-speed trains will incorporate state-of-the-art technology, a modern look and feel, best-in-class interior design and necessary amenities. Visualization and prototyping at each stage of the process will be

used to test and improve designs and will involve potential users as well as internal and external stakeholders in the development of the designs.

Industry assessments of global manufacturers capable of producing service-proven trains with potential operating speeds of 220 miles per hour have been conducted. Performance specifications have taken global best practices into consideration, and we have applied our national working knowledge of U.S. regulations and industry standards, which are detailed in our design criteria manual.

As previously discussed, staff is currently conducting workshops in which various train and track and systems procurement options are being evaluated. As part of these discussions, we are considering the required maintenance facilities and the maintenance needs for the infrastructure as well as trains.

We continue to work closely with the FRA as the agency develops new passenger and crew safety regulations that will govern high-speed operations. The FRA is currently considering rules for intercity passenger service that would operate in a shared right of way at speeds not exceeding 125 mph and

in an exclusive right-of-way at speeds between 125 to 220 mph; the Authority is participating in this process.

Finally, we are also coordinating our specifications to be compatible with the Brightline West system including looking at train width and platform requirements through discussions with FRA, Caltrans and Brightline West on elements that could affect future interoperability.

Given the long lead time for train design and manufacturing requirements, our goal is to begin the procurement process in 2023 to ensure that trains are available for the required testing and certification process. This will be essential to meeting our goal of initiating revenue service by 2030 - 2033.

Closely related to the trains is locating the operations and maintenance facilities. Building upon the previous environmental work, a project level environmental clearance process is underway to select a preferred alternative site for the heavy maintenance facility. This facility will be developed and built as part of the trains procurement. It could be used for final assembly of the trainset and will be designed



Renderings: High-speed rail train interiors

and built by the manufacturer to assure efficient train maintenance. Through this environmental review process, the preferred alternative will be selected that best meets the Authority’s operational requirements.

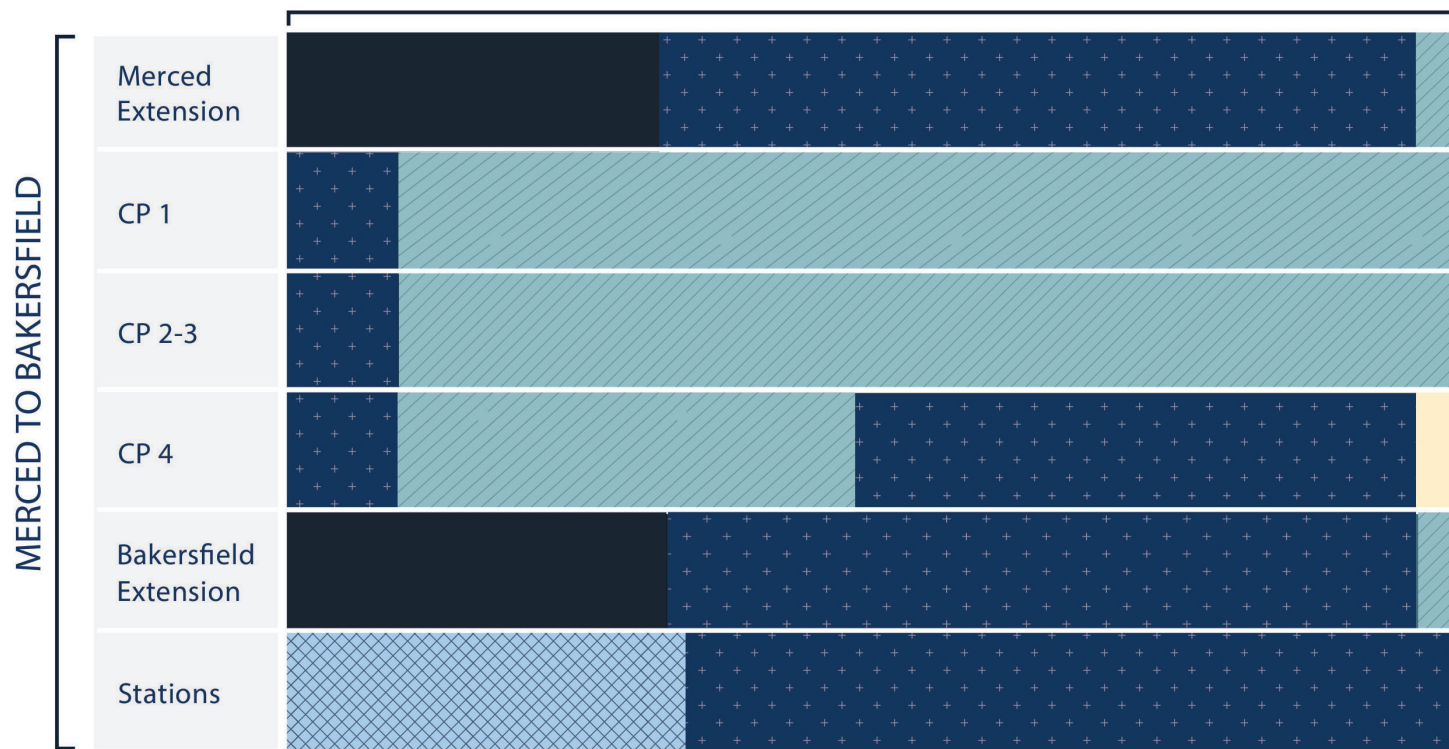
Putting it All Together

Our goals are clear as we move forward. We intend to complete the work on the 119 miles now in construction, all environmental work statewide and the bookend projects, because those are commitments we have made to the federal government and our local partners, and we have funding to do so. We will continue to maximize federal funding to

complete Merced to Bakersfield because that is still the best operating segment to use the assets currently being built. This work will include important deliverables starting in 2023 and beyond:

- First construction package in the Central Valley reaches completion this year;
- Finish the environmental work between San Francisco and Los Angeles by the fourth quarter of 2023 and to Anaheim in 2025;
- Continue expanding construction job creation beyond 10,000 in 2023;
- Execute the contract to lay the first track in the Central Valley by 2024;

Exhibit 1.7: Roadmap



Trains

Design, Delivery and Testing of Trains

2023

Environmental Clearance
Planning

Design and Early Works
Construction

- Complete all construction work on the 119 miles by 2026 and finish laying track by 2027;
- Be ready to test trains on the 119 miles in 2028; and
- Utilize federal funding to fill the gap on the Merced to Bakersfield segment and get operational as soon as possible within the schedule envelope of 2030 to 2033.

All of the elements described above – the guideway with track and systems installed, the stations, the operations, maintenance and power facilities, and the high-speed trains – will need to be delivered and integrated into a system. That system will then need to undergo significant testing to not only meet federal requirements but to also ensure that

when service begins, the service meets passenger needs in terms of speed, reliability, convenience and effective transfers to other systems. **Exhibit 1.7** provides a roadmap of how the pieces come together and the testing phases that must be completed to be fully operational. The roadmap generally illustrates the timeframes, sequencing, and relationship between various elements of delivering the Merced to Bakersfield line over time. The exact approach may vary as the Authority further defines its procurement and construction strategy. Note that the design/early works for track and systems is shown only in CP 4 because this phase occurs at the beginning of the contract which will support the remaining segments of track and systems construction.

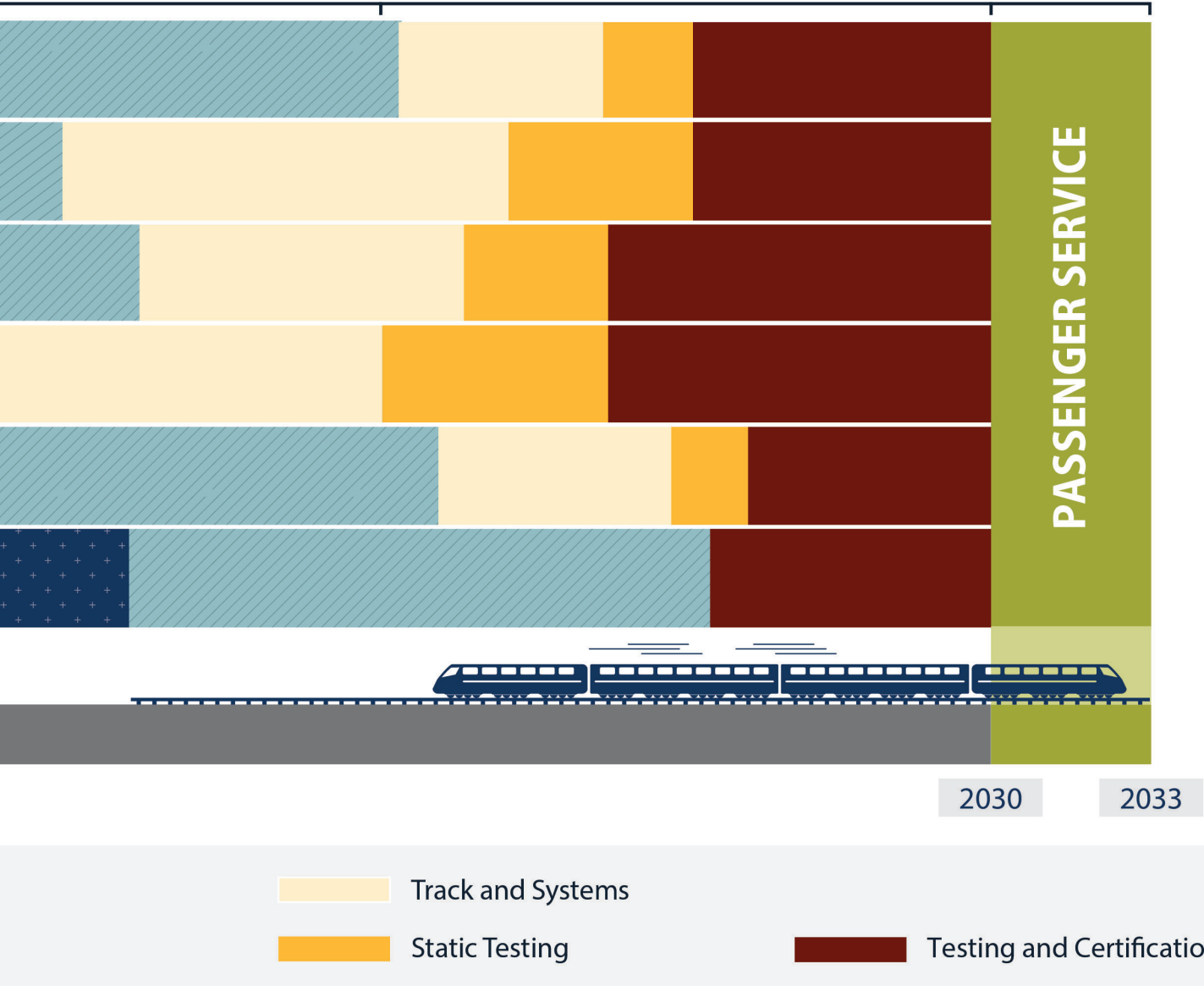




Photo: Conejo Viaduct



Rendering: Cedar Viaduct

Chapter 2: *Getting Into Operations*

INTRODUCTION

From its inception, the Authority determined that the system should be developed and operated in partnership with other transportation and rail agencies to integrate new high-speed rail service with existing services. Partnering also creates greater efficiencies and more cost-effective operations. More recently, in the 2022 Budget Agreement, the Legislature emphasized the importance of developing and reporting on the agreements that will be required to plan, fund, build and operate high-speed rail and connecting services in the Merced to Bakersfield corridor.

Over the last two years, the Authority has begun planning and identifying the steps necessary to connect future operations into that existing state network. This has involved engaging with the San

Joaquin Joint Powers Authority (SJJPA), the San Joaquin Regional Rail Commission (SJRRRC), the California State Transportation Agency (CalSTA) and the California Department of Transportation (Caltrans), as well as the Federal Railroad Administration (FRA).

Authority staff have actively engaged with Central Valley rail partners since 2019 beginning with the Central Valley operations analysis documented in the [Central Valley Segment Systems Management & Operations Interim Financial Plan](#) (June 2020). This study outlined initial agreed-upon assumptions, estimated operations and maintenance costs, and utilized the State Rail Plan ridership model to estimate the potential revenue and ridership benefits of the combined services. The analysis was based on an integrated service plan including the Altamont Corridor Express (ACE), San Joaquin inter-

city rail service, and intercity buses connected with high-speed rail service from Merced to Bakersfield. Following that, the Board of Directors requested that the Authority's financial advisor, KPMG, develop a [***Business Case Assessment Study***](#) (February 2020) for the proposed interim service between Merced and Bakersfield. This assessment evaluated a range of issues including funding and affordability, commercial considerations, risk and mitigation strategies, and the potential business model. And it recommended that the Authority pursue an inter-agency agreement with other agencies and secure a sufficient level of commitment, through a Memorandum of Understanding (MOU) with regional partners and CalSTA, before making major long-term commitments and operating decisions for interim service between Merced and Bakersfield.

Subsequently, in November 2020, the Authority, CalSTA and the SJJPA signed an [***MOU***](#) to facilitate cooperation and coordination in the development of parameters for early interim operation of this interconnected network.

In addition, the Authority coordinates with the FRA on the development of new high-speed rail federal regulations to oversee the development and implementation of new infrastructure, systems, trains and operational rules associated with this new type of passenger service.

A Connected Regional Network

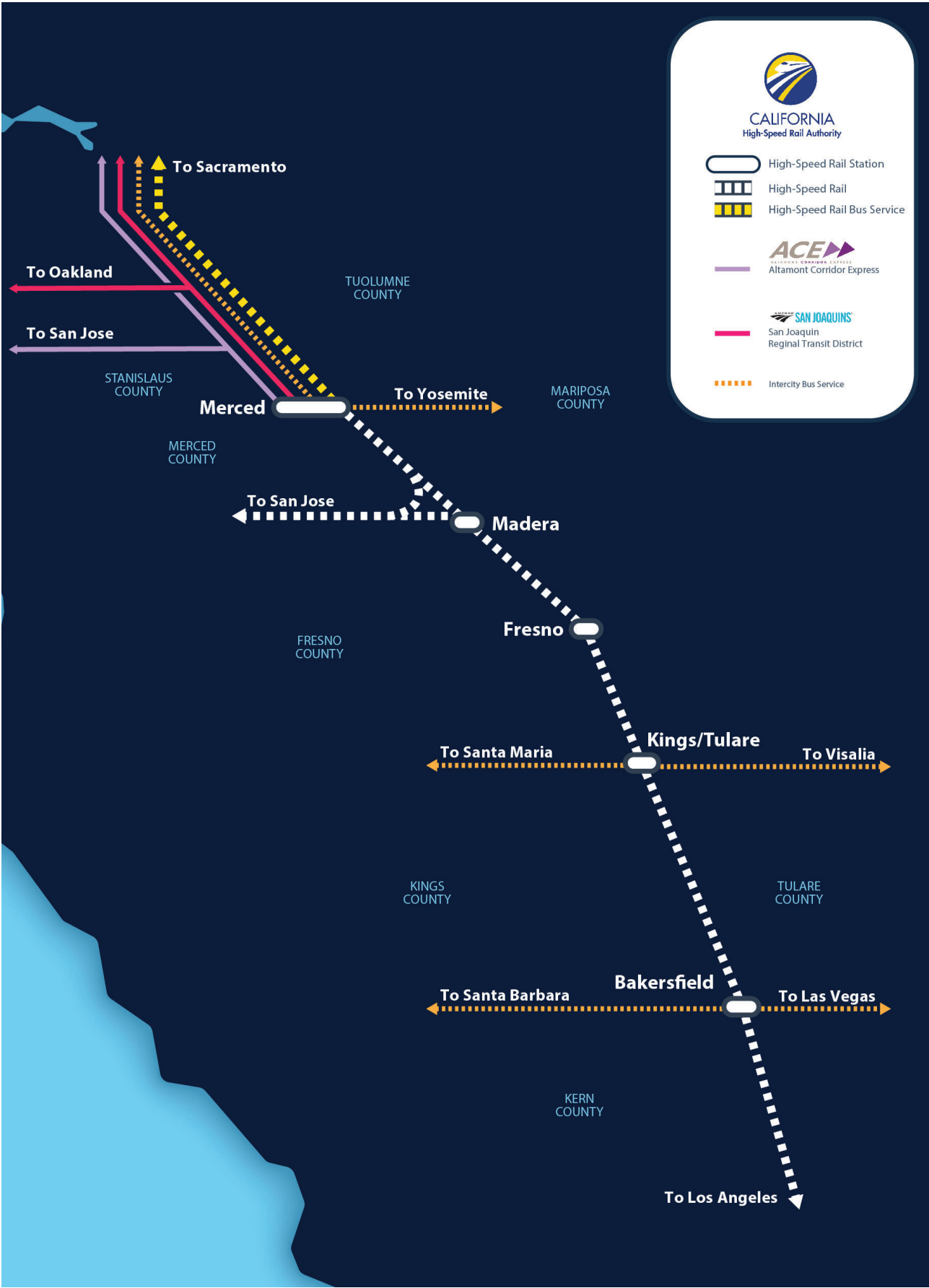
Establishing high-speed rail in the Merced to Bakersfield corridor, which will reduce travel times by nearly 100 minutes, represents a major mobility transformation in California by providing the backbone of a connected, integrated and synchronized network.

[**Exhibit 2.0.**](#) shows the connections that will be possible throughout the San Joaquin Valley, as well as new access to Northern and Southern California destinations that will be possible.

The Authority is working with its partners on critical planning elements to ensure connectivity to that existing network. This includes:

- Coordinated rail service schedules with connecting services north of Merced and south of Bakersfield;
- Infrastructure development at the Merced Station and track connections, including a new connection from the BNSF Railway corridor, that will allow San Joaquins services to terminate at the Merced Station, which will feature a new platform that will allow for a cross platform transfer between the San Joaquins trains and high-speed rail trains;
- Operational organization and processes and evaluation of a universal operator for all services funded by the State; and
- Financial agreements, including conditions of use, governance and fees for the use of high-speed rail infrastructure and trains by the SJJPA.

EXHIBIT 2.0: A Connected Regional Network



Roles and Responsibilities

The ongoing coordination with these Central Valley partners has resulted in a general outline of the various roles and responsibilities of each as documented in the MOU. These agreements will continue to expand and evolve over the next several years.

The MOU outlines specific roles and responsibilities. It states that the Authority is responsible for planning, designing, constructing and operating high-speed rail including:

- Providing system access to the SJJPA for the use of high-speed rail infrastructure and related assets;
- Maintaining the civil infrastructure, stations, track and railway systems, and associated facilities;
- Providing and maintaining high-speed trainsets and a train maintenance facility; and
- Providing, maintaining and operating an Operations Control Center (OCC) for dispatching, incident management and housing SJJPA Operations staff to facilitate passenger service coordination.

California State Transportation Agency (CalSTA)

CalSTA develops and coordinates the policies and programs of the State's transportation entities, including the Authority and Caltrans. It is responsible for overall planning, coordination and budgeting of intercity passenger rail service and delegates specified administrative and oversight responsibilities to Caltrans.

San Joaquin Joint Powers Authority (SJJPA) and San Joaquin Regional Rail Commission (SJRRC)

The SJJPA is responsible for the governance, operation and management of the San Joaquins intercity passenger rail service between the cities of Bakersfield, Fresno, Madera, Merced, Modesto, Stockton, Sacramento and Oakland. The SJRRC oversees the SJJPA which manages the San Joaquins intercity passenger rail service. SJRRC owns and operates the ACE commuter rail service from Stockton to San José. ACE operates trains from the Central Valley to the Bay Area with stops in San Joaquin, Alameda and Santa Clara counties. Under the MOU, the SJJPA will act as the high-speed rail service provider of the Central Valley early operating segment and reimburse the Authority for the use of high-speed rail infrastructure, trains, and related assets in an amount sufficient to cover the Authority's costs related to early service.

California Department of Transportation (Caltrans)

Caltrans provides oversight of intercity rail services managed by the joint powers authorities, including the SJJPA. Caltrans owns and manages the intercity rail rolling stock used for providing these services. The Authority and CalSTA/Caltrans entered into an interagency agreement to further refine the Central Valley Operations and Financial Plan, including a strategic implementation plan.

Federal Railroad Administration (FRA)

The FRA's mission is to enable the safe, reliable and efficient movement of people and has two main high-speed rail roles (1) as a funding partner with oversight on project implementation and (2) as a safety oversight organization. The Authority has developed a compliance roadmap which outlines our plan to comply with both European Normatives and the appropriate FRA Codes of Federal Regulation. The European Union (EU) developed com-

prehensive standards and regulations, along with a formal process, that allows for interoperability of trains throughout the EU. The FRA has indicated that it is receptive to our proposed approach to prove compliance with the federal codes.

Federal Surface Transportation Board (STB)

The Authority's high-speed rail system is also under the jurisdiction of the Federal STB, which has jurisdiction over transportation rail carriers. The Authority must request the STB's approval to both construct and operate portions of the high-speed rail system. On December 20, 2022, the STB approved the Authority's request to construct on the two remaining environmentally cleared portions of the Merced to Fresno and Fresno to Bakersfield project sections. With these approvals, the Authority can move forward to complete the construction for the extensions to Merced and to Bakersfield that is necessary to begin operations in this corridor.

MOVING FORWARD

The Authority continues to progress discussions with partners on the various operating agreements required to implement high-speed rail service in the Central Valley. This work involves evaluating different scenarios to further develop and address current questions, including:

- Roles and responsibilities and staffing needs during pre-operations and revenue operations;
- Timing of, and content for, detailed interagency agreements between the Authority, CalSTA, the SJJPA and/or the SJRRC;

- Testing, commissioning and certification;
- High-speed trains procurement strategy;
- The operating business model;
- Stations, including infrastructure, roles, responsibilities and operations;
- Fare policy, fare integration and fare collection;
- Funding;
- Implementation schedule, including critical path, sequencing and dependencies;
- Updated integrated service plans;
- Updated operating concept (high-speed rail plus regional rail and intercity bus);
- Updated operations and maintenance cost estimates and ridership and revenue forecasts;
- Transition plan and phasing approach between the Central Valley and future high-speed rail system building blocks; and
- New infrastructure needs of local/regional transit operators to implement service to the high-speed rail stations for Central Valley operations.

Funding and Building Merced Intermodal Connections

The 2022 Budget Agreement emphasized the importance of completing an agreement or agreements between the state, the SJJPA, the SJRRC and the Authority that details the role of each in planning, constructing and funding the connections in the city of Merced. **Exhibit 2.1** shows these improvements and a rendering of how the services meet at the Merced Station.

The SJRRC and the SJJPA have identified a set of projects to connect regional services with high-speed rail at the new Merced Station. These projects include the Valley Rail Expansion, Altamont Corridor Express (ACE) and Ceres to Turlock Extension Project. The **Merced Intermodal Track Connection Project** includes a new track connection from the BNSF corridor to the new integrated station in downtown Merced.

The SJJPA has committed to prioritizing the development of regional rail connectivity infrastructure, including securing the additional funding necessary for these improvements. In January, CalSTA announced the 2023 Transit and Intercity Rail Capital

Program awards. Funds were awarded for project improvements throughout the ACE and San Joaquin service area, including funding for the Merced station project. The Authority and the SJJPA have a working group focused on sharing design concepts, coordinating schedules and confirming common assumptions.

Key Agreements for Operating Passenger Service

The Authority has laid out a business model for interim service in the Merced to Bakersfield corridor following an “infrastructure owner” approach. Under this approach, the capital infrastructure would be leased to a separate public entity to provide passenger service. An element of these discussions is to detail and evaluate the concept of establishing a “universal operator” under the management of the SJJPA to operate a set of integrated rail services. Specific sub-agreements are under development, as shown in **Exhibit 2.2**, that are necessary to detail the operating relationships and requirements of each agency for asset leasing and operating cost responsibilities. Agreements would also be required to detail the requirements of a universal operator.

Exhibit 2.1: Merced Connections

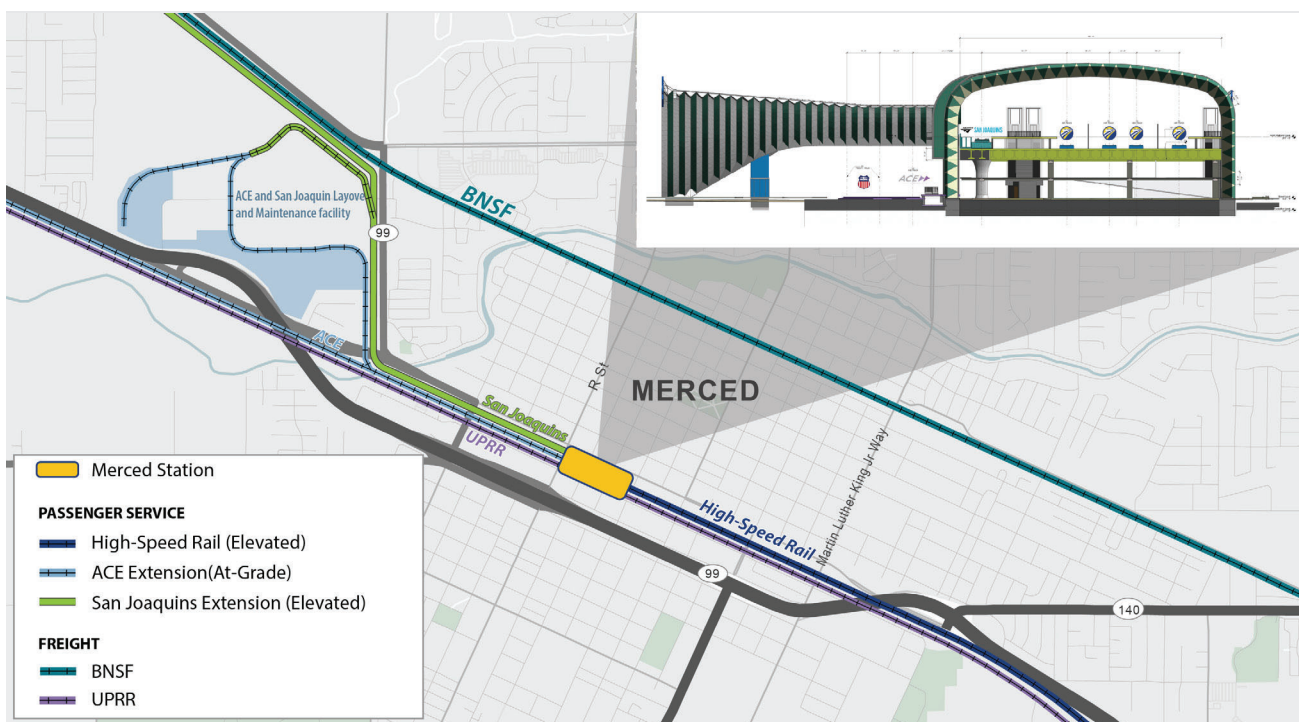


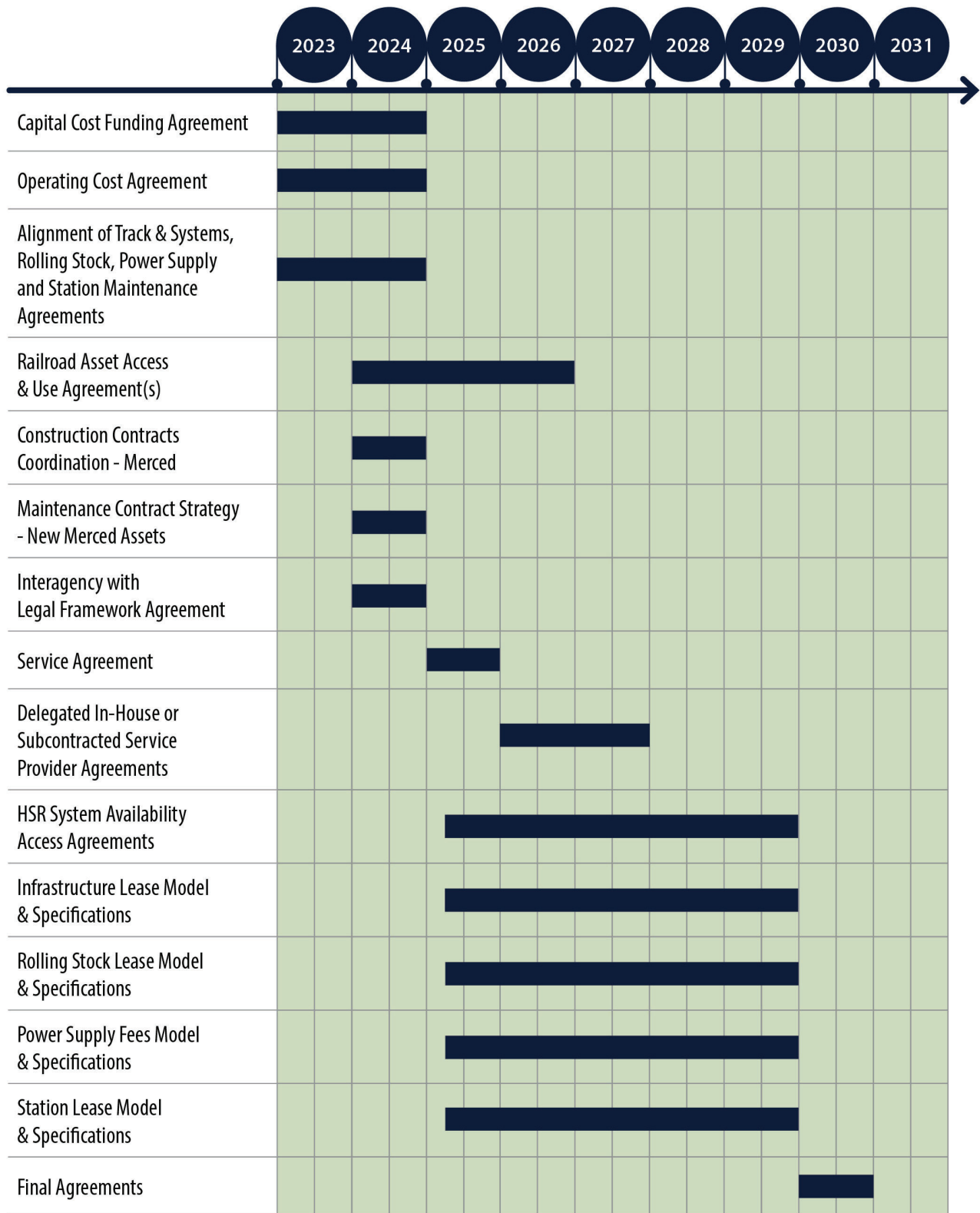
Exhibit 2.2: Operating Agreements Timeline

Exhibit 2.3: Business Model

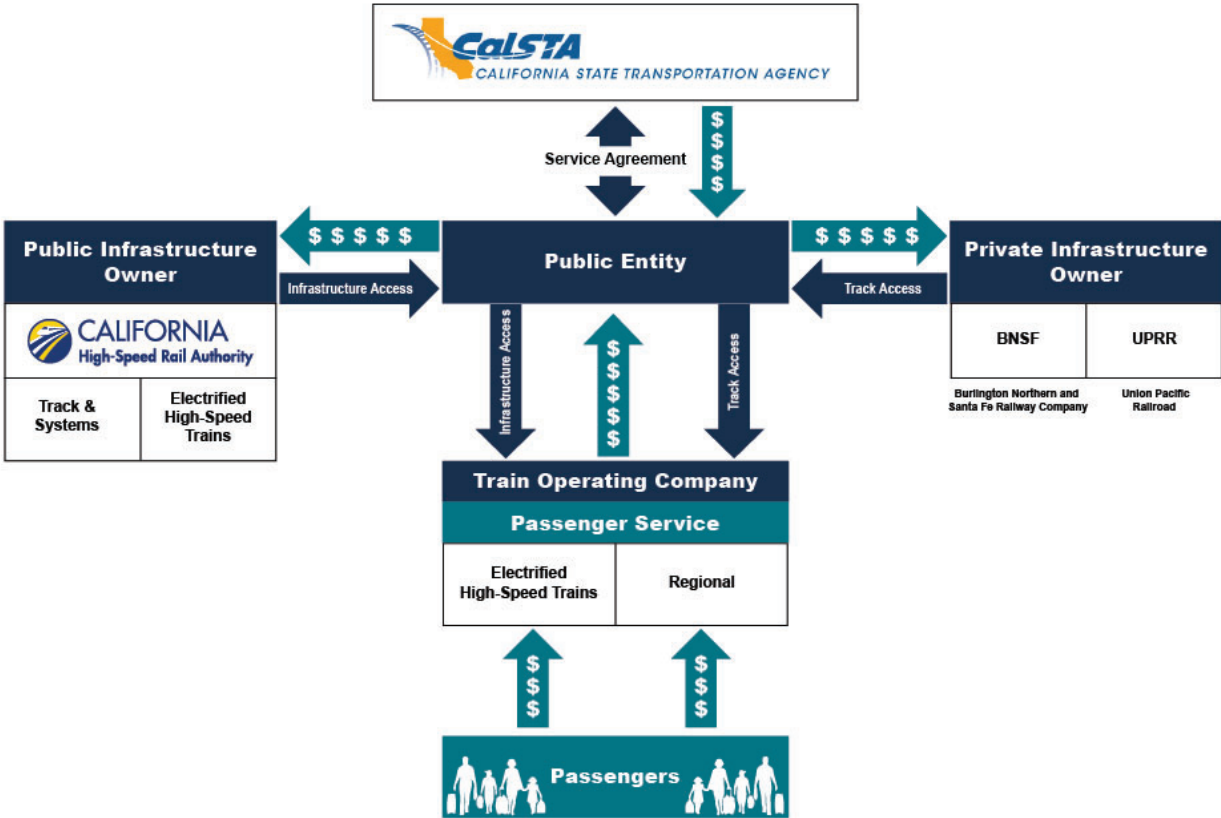


Exhibit 2.3 illustrates the working relationships under this infrastructure owner business model approach. By way of comparison, the infrastructure owner concept is similar to the San Joaquins current operation – BNSF is the infrastructure owner providing track rights to the SJPA (public entity) which pays BNSF to use the tracks for passenger service.

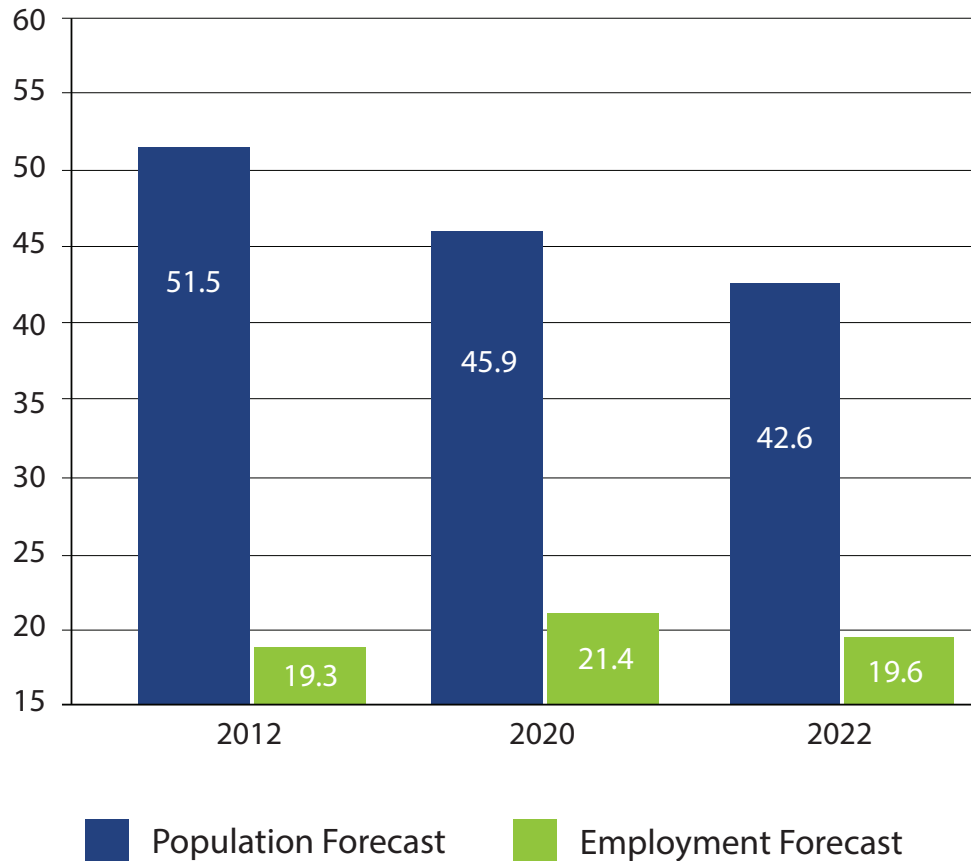
NEW RIDERSHIP MODEL AND FORECASTS

In 2019, in coordination with CalSTA and Caltrans, the Authority began developing a new, more detailed ridership and revenue forecasting model. The new model – which is called the *California Rail Ridership Model* – provides a detailed ability to understand the ridership effect of connecting high-speed rail with regional and local rail and transit services. It is also designed to evaluate how specific changes in assumptions may affect high-speed rail

operations in the 171-mile Merced to Bakersfield corridor, as well as future operations on the Silicon Valley to Central Valley (Valley to Valley) line and the full 500-mile system between San Francisco and Los Angeles/Anaheim.

Updated Data

Development of the California Rail Ridership Model involved an extensive new data collection process including updated population and employment forecasts for a 2040 horizon year based on California Department of Finance and Caltrans’ Economics Branch estimates. These updated forecasts shown in **Exhibit 2.4** reflect a trend showing that population and employment growth are flattening and not expected to grow as fast as projected and used in the previous model. These updated demographic forecasts have affected overall travel demand in the state, including rail ridership forecasts.

Exhibit 2.4: Updated Population and Employment Forecasts for 2040 (in Millions)

In addition to updated demographic data, a new “stated preference survey” was conducted plus the new model framework now includes sensitivity testing and risk analysis capabilities.

Assumptions

The Authority’s service plan for the Merced to Bakersfield corridor assumes hourly, bi-directional service for 18 hours per day, seven days a week. The service planning refinements include a more detailed evaluation of the train and intercity bus connections at the Merced Station and the intercity bus connections at the Bakersfield Station. They also include recommendations from the [South of Merced Study](#) conducted by the San Joaquin Regional Rail Commission (SJRR) in 2021 to improve regional intercity and transit connectivity between Kings/Tulare Station and Bakersfield Station.

In preparing the forecasts with the *California Rail Ridership Model*, the Authority evaluated a unified fare system for the different bus and rail services with fares being largely aligned with the existing fare structure. This unified fare system will align the standalone fare policies of the various services into one system, creating a more customer-friendly experience for the ticketing and fare collection systems.

These assumptions inform the ridership modeling and – at a later stage in the analysis – will inform the operations and maintenance cost modeling for the universal operator concept. It is important to note that these assumptions are designed to prepare the initial ridership forecasts for this 2023 Project Update Report using the new business model. Further refinements will be made through ongoing discussions and agreements among all the partners.

Initial Ridership Forecasts

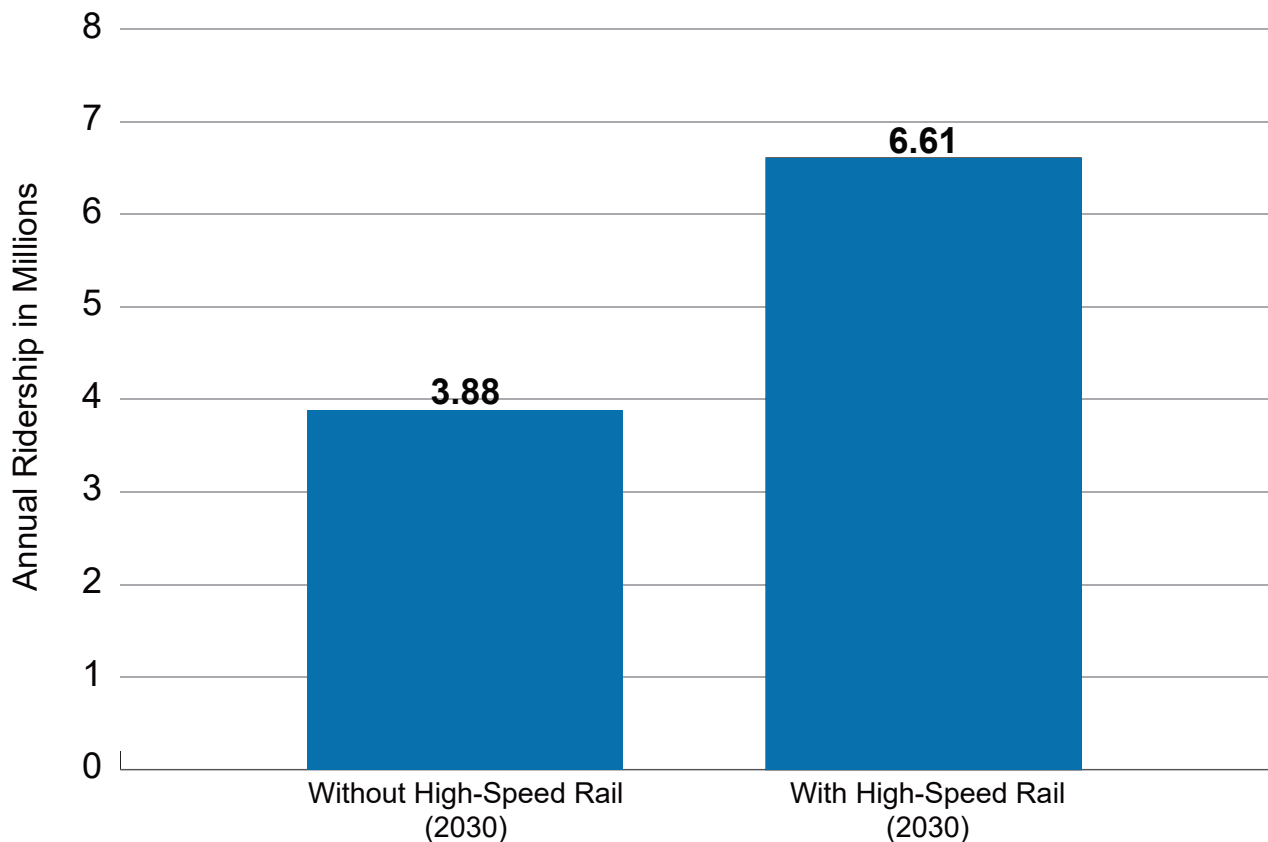
The first step in using the new *California Rail Ridership Model* ridership model, along with the updated data and assumptions, was the preparation of ridership model runs at 2030, 2040 and 2050 time horizons. The next step is to make continued refinements with our partners and prepare further updates to ridership and other related forecasts for the 2024 Business Plan.

As the analyses are refined with our partners, ramp-up will be applied for the first few years of operation. The ramp-up period recognizes that ridership will be relatively lower in the first few years after the new service is introduced to the traveling public. More specifically, implementing high-speed service in the Merced to Bakersfield corridor – with new timed, cross-platform connections – will attract a new travel market that will grow over time (ramp up) as more people become aware of the new service. The ridership forecasts presented in this report do not account yet for ramp up and shows ridership

data for a 2030 horizon year, as shown in [Exhibit 2.5](#). Specifically, 6.6 million annual trips are estimated to occur in the entire system (including connecting rail and intercity bus services), with 2.3 million trips traveling on the high-speed rail segment.

Based on the updated assumptions discussed above, ridership is projected to increase to 6.9 million trips by 2040 and to 7.2 million trips by 2050. Compared to the estimates presented in the [Central Valley Segment Systems Management & Operations Interim Financial Plan](#) and the 2020 Business Plan, overall system ridership is expected to be 25% lower due to the lower socio-economic growth forecasts and the changed assumptions from the more detailed modeling approach and updated user behavior data.

Exhibit 2.5: Central Valley Ridership with High-Speed Rail (2030)

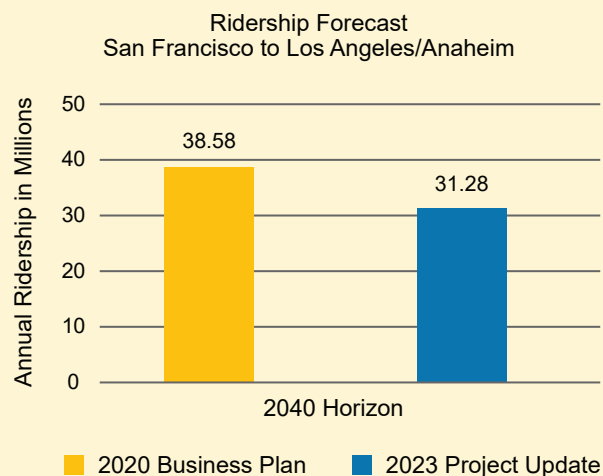


Future Ridership Forecasts

Because of its speed, reliability and connectivity, intercity ridership in California will achieve new highs and will be comparable to intercity ridership on the well-established Northeast Corridor.

- 11.5 million annual riders are predicted to ride the Silicon Valley to Central Valley line (2040 horizon year), comparable to the pre-pandemic 12.5 million riders that traveled on the Northeast Corridor's intercity service in 2019. It is more than double the 5.6 million riders served in 2019 by California's three state-supported services – Pacific Surfliner, San Joaquins and Capitol Corridor.

- 31.3 million riders are predicted on the San Francisco to LA/Anaheim line (2040) – about two and a half times the ridership on the Northeast Corridor's intercity service in 2019. This is slightly lower than our previous forecast as shown in the exhibit below. This is also due to the lower socio-economic growth forecasts and other updates previously discussed. Nevertheless, it is a strong forecast for future intercity travel on high-speed rail that will continue to increase over time.



Continued Development of Forecasts

As noted above, the next step is to make continued refinements with our partners and prepare further updates to ridership and other related forecasts for the 2024 Business Plan. More specifically, we are, in collaboration with our partners, working to update the previous analyses presented in the 2020 and 2022 Business Plans. This includes updating and refining service plans, fare assumptions, operating cost structure, ridership and revenue forecasts, and ramp up for the future Central Valley integrated service rail concept. This will lead to a comprehensive update to the Authority's ridership, revenue and operating costs estimates for the Merced to Bakersfield corridor, along with the Silicon Valley to Central Valley and San Francisco to Los Angeles Anaheim forecasts, as part of the 2024 Business Plan.



Photo: San Joaquin River Viaduct



Photo: State Route 46 Overpass

Chapter 3:

Funding and Costs

INTRODUCTION

This chapter outlines current funding and cost estimates for the California high-speed rail program and the Authority's plan to obtain new federal grants from the Bipartisan Infrastructure Law (BIL). To put that information into context, it is important to assess the current maturity of funding programs for high-speed rail in contrast to funding for other modes such as highways – this chapter includes a section on that context.

Securing large new federal grants is a necessary and critical step to achieve our goal of delivering high-speed passenger rail. Currently, state and local funding alone are not enough to achieve our goal, and federal support continues to be as important today as ever. What has changed is the federal funding landscape. The Bipartisan Infrastructure Law (BIL) is a once-in-a-generation investment in our nation's infrastructure, including passenger rail.

"[I]t's [the] biggest investment in passenger rail since Amtrak's creation. China already has 22,000 miles of high-speed rail, which will double by 2035. Japan has had high-speed rail for nearly 60 years. And now, America will invest in bringing world-class rail across the country, upgrading and expanding Amtrak, investing in new passenger rail improvement, like the California High-Speed Rail Project."

– Speaker Emeritus Nancy Pelosi

There is more than \$75 billion in new and increased BIL funding eligible for passenger and freight rail projects through discretionary grant funds. This funding can drive the advancement of safe, efficient and climate-friendly transportation alternatives, such as high-speed rail. We believe that there are significant new funding opportunities for the high-speed rail program stemming from the BIL, as well as a range of other federal programs that could provide long-term sources of revenue to fund the construction of future project sections. In 2021 and 2022, the Authority received \$49 million in funding from two Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grants.

At the state level, California policymakers have affirmed their continued commitment to delivering the nation's first high-speed rail system with the appropriation of the remaining \$4.2 billion in Proposition 1A funds in 2022. Together with previously appropriated Proposition 1A and Cap-and-Trade funds, the state's share of total program appropriated funds to-date stands at about 85% compared to the federal government's share of 15%. Even with the increase in federal funding allocated toward rail projects, California continues to bear a significant portion of the costs of high-speed rail project.

The California high-speed rail program is uniquely positioned to immediately deploy new federal funding investments, that will supplement current state funds, toward the delivery of the initial high-speed rail line between Merced and Bakersfield and to advance design on crucial segments in both

Northern and Southern California. The Authority has submitted three grant applications, pending federal decisions, and plans to submit multiple federal grant applications over the 5-year BIL program with a total award target of about \$8.0 billion. These funds would support the initial high-speed rail line between Merced and Bakersfield, and advance design work for the remaining San Francisco to Los Angeles/Anaheim sections.

This chapter first presents a brief history of high-speed rail funding in the context of other transportation modes. Second, it provides an update on the sources of funds that are currently available to the Authority, which will be applied to construction that is already ongoing or to planning activities that have already been budgeted. Third, this chapter reviews future funding sources that the Authority has identified, but not secured, to progress construction of the program in all regions of the state. Fourth, we discuss optimizing federal funds with matching funds. Finally, this chapter reviews the affordability of various cost and funding scenarios of the Authority's capital program.

To see updated information on project funding and expenditures on an ongoing basis, see the [Finance and Audit Committee webpage](#). This subcommittee of the Board of Directors meets monthly to discuss a range of financial reports, including accounts payable, cash management, project expenditures and the capital outlay budget.

HIGH-SPEED RAIL FUNDING IN THE CONTEXT OF OTHER MODES

Over the course of American history, federal, state and local governments have invested enormous sums of money on transportation infrastructure to generate economic growth. The United States has been investing in the following modes over these periods: about 250 years of investment on the St. Lawrence Seaway System, about 200 years of investment in the freight-rail network, and about 100 years of investment in what is now the Interstate Highway System. In contrast, U.S. investment in construction of true high-speed rail has been going on for only about 10 years.

While funding mechanisms for those other modes have evolved over time, they have stabilized with permanent funding streams. Federal highway funding has been significant and stable for nearly 70 years, since President Eisenhower's National Interstate Defense Highways Act of 1956, with the federal fiscal year 2022 national apportionment of highway funds at \$52.5 billion. States have also generated permanent funding streams for highways, and the [California Department of Transportation budget](#) totals about \$19.6 billion for 2022-23, including federal funds. State funding for California high-speed rail will end in 2030, which is the end date in current law for the State's Cap-and-Trade Program.

In recent years, both the federal government and the State of California have directed significant one-time or limited-time funding to high-speed rail, but neither has established permanent funding. This chapter outlines the proposed approach to leverage existing state funding, with substantial new awards the Authority hopes to receive from the Bipartisan Infrastructure Law, to deliver high-speed rail service between Merced and Bakersfield. Additionally, connections to the Bay Area and Southern California remain unfunded. If policy makers choose to deliver high-speed rail beyond the Central Valley – in California and nationally – funding commitments for high-speed rail will have to be permanent and substantial, as was the case starting in the 1950s for highways.

“Even with a realistic share of new federal funding, the project cannot get outside the Central Valley without added state or local funding from sources not yet identified.”

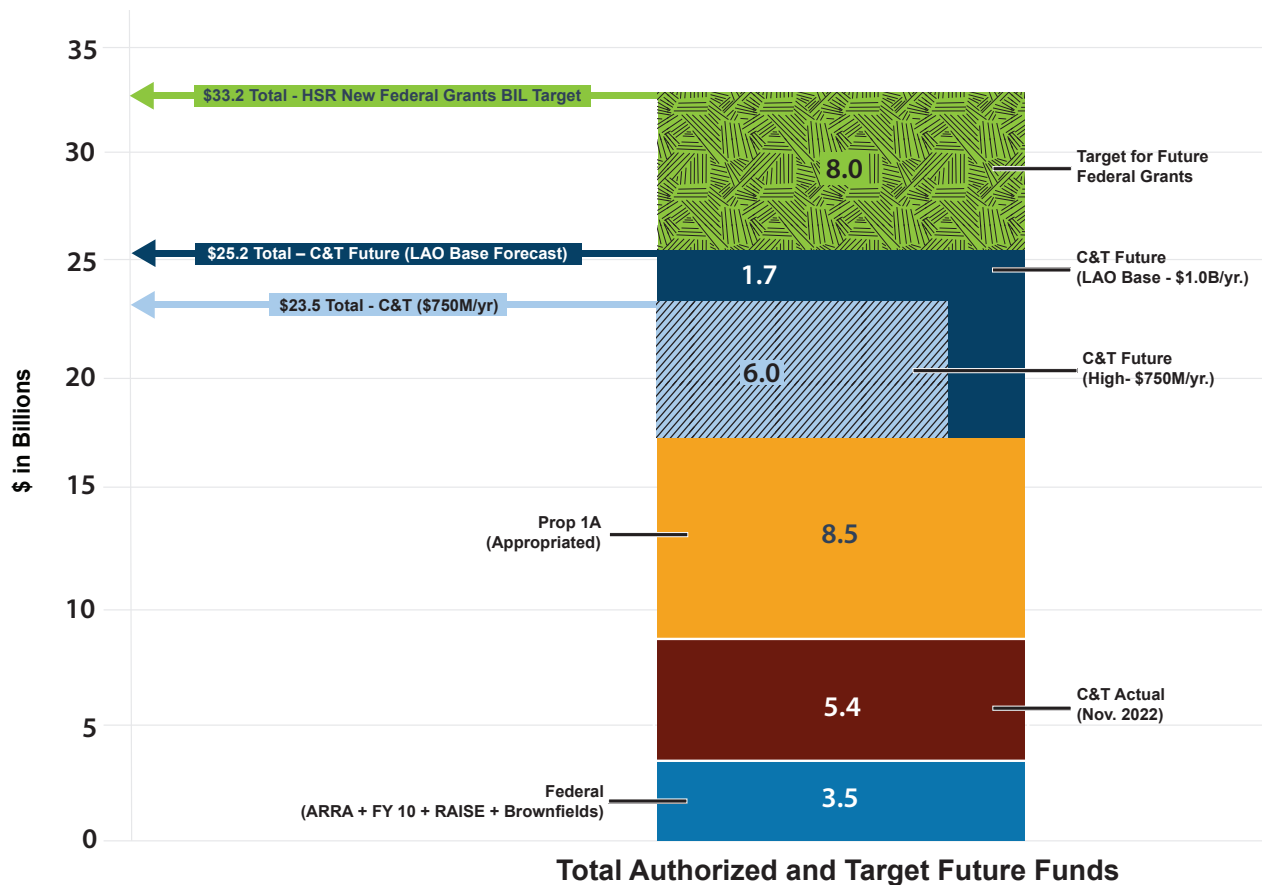
– Louis S. Thompson, Chairman,
California High-Speed Rail Peer Review Group

CURRENT FUNDING

This section provides an overview of the current and projected funding available to the program through 2030, as shown in **Exhibit 3.0**. The total amount of identified revenue for the capital program is currently estimated in the range of \$23.5 billion to \$25.2 billion, assuming a Cap-and-Trade annual revenue range of \$750 million to about \$1.0 billion per year. For the high of that range, the Authority is using the

funding scenario that was the Legislative Analyst's Office's (LAO) Cap-and-Trade **base revenue forecast** of approximately \$1.0 billion in FY22-23, and extending that through 2030. In addition, the Authority is targeting about \$8.0 billion in future federal grant funds from the Bipartisan Infrastructure Law (BIL). When added to LAO base forecast scenario, this would result in \$33.2 billion of total funds.

Exhibit 3.0: Currently Available, Authorized and Future Funding



*Totals may not sum due to independent rounding

**Legislative Analyst's Office (LAO) December 2021 C&T Revenue Base Case Forecast FY22-23 less "off the top" reductions

***Portion of future C&T revenues may be used to fund admin support activities

****Portion of Prop 1A may be used to fund admin support activities

Current State Funding

The Authority has secured funds from two State sources: Proposition 1A bond funds and Cap-and-Trade funds. No State of California General Fund, gas or road-usage tax dollars are allocated to the high-speed rail project.

Proposition 1A

In 2008, voters approved Proposition 1A, which provided a total of \$9.95 billion for high-speed rail planning and construction, along with regional connectivity projects. Of the total, \$9 billion of the proceeds are being or will be used to build the high-speed rail system. In 2012, the Legislature appropriated \$3.7 billion in Proposition 1A funds for construction in the Central Valley, Caltrain electrification in Northern California and the Link US and Rosecrans/Marquardt Grade Separation projects in Southern California. An additional \$1.1 billion was appropriated for project development and administrative costs.

Assembly Bill 180 and Senate Bill 198, passed by the California State Legislature and signed by Governor Newsom in June 2022, appropriated \$4.2 billion in Proposition 1A bond funds and directed those

funds to support completion of a two-track, electrified 171-mile high-speed rail line between Merced and Bakersfield. The legislation requires an updated schedule and cost estimates to be presented in this Project Update Report, which will be reviewed by the Inspector General prior to the release of the final \$2.2 billion of the 2022 appropriation. For more information on the statutory requirements for this 2023 Project Update Report contained in the Budget Agreement, see Appendix A.

Cap-and-Trade

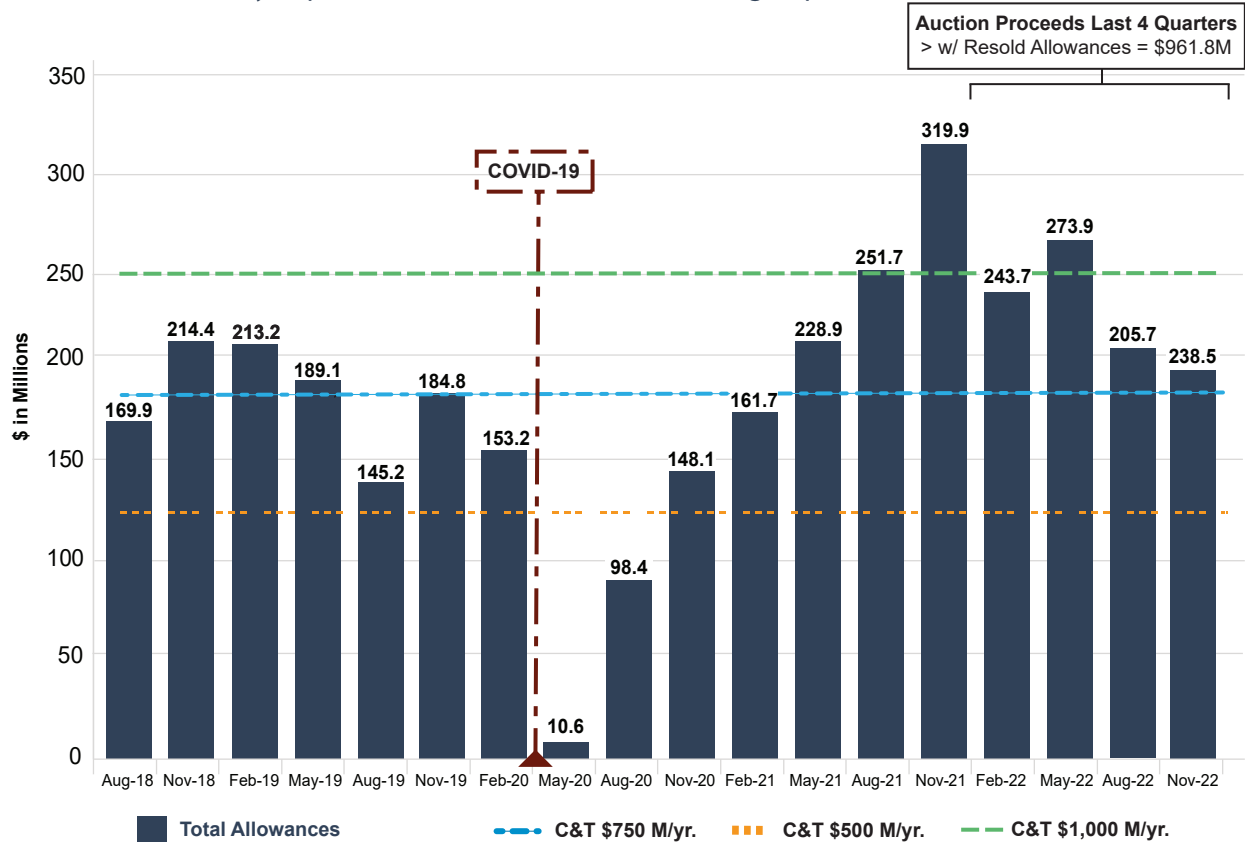
The California Cap-and-Trade Program, a trading system of carbon-emissions allowances, covers approximately 80% of California’s greenhouse gas (GHG) emissions. The program is a central policy that underpins the California Air Resources Board’s Scoping Plan to, by the year 2030, reduce GHG emissions by 40% from 1990 levels. The California Air Resources Board implements the program and oversees the quarterly auctions, which are a long-term source of funding for the high-speed rail project and for regional transit and rail projects statewide. The Authority has a continuous appropriation of 25% of Cap-and-Trade auction receipts, after adjustments. The Authority has received a total of \$5.4 billion in Cap-and-Trade funds through the November 2022 auction.

As part of the 2022 Budget Agreement, Cap-and-Trade funds are prioritized for existing commitments and for finishing the Merced to Bakersfield segment. It is important to note, that spending on high-speed rail has been an investment in disadvantaged com-

munities. An average of \$700 million/year, ranging from 50% to 65% of annual expenditures, has supported businesses in disadvantage communities since FY 2016/2017. New commitments outside the Central Valley are limited until the Merced to Bakersfield section is fully funded.

As shown on [Exhibit 3.1](#), the last four auctions yielded \$962 million in Cap-and-Trade total revenues for the Authority, significantly above the Authority’s established high range of \$750 million per year estimate. The last four auctions’ revenue aligns with the Base Forecast in the Legislative Analyst’s Office (LAO) December 2021 [Cap-And-Trade Auction Update and GGRF Projections](#) report which contains three Cap-and-Trade revenue forecasts under various allowance price scenarios. Consistent with the 2022 Business Plan, this report includes a scenario that uses and extends the Legislative Analyst’s Office’s Cap-and-Trade Base Forecast, which translates to around \$1.0 billion per year after subtracting “off the top” adjustments for wildfire protection and AB 398 fire prevention fee and manufacturing tax revenue backfills.

Exhibit 3.1: Quarterly Cap-and-Trade Auction Proceeds for High-Speed Rail (\$ in Millions)



Current Federal Funding

California has received federal funding for the high-speed rail project from multiple sources.

FRA ARRA and FY 10 Grants and EPA Brownfields Grant

The project received funding through the Federal Railroad Administration's (FRA) High-Speed Intercity Passenger Rail (HSIPR) Program, which was launched in 2009. The project also received federal funding through the HSIPR program under the American Recovery and Reinvestment Act of 2009 (ARRA) and the Consolidated Appropriations Act, 2010 (FY 10):

- The Authority received approximately \$2.55 billion in ARRA Grant funds. These funds have been fully expended for initial construction in the Central Valley and advancing engineering and environmental reviews along the entire 500-mile Phase 1 system connecting San Francisco/Merced to Los Angeles/Anaheim.
- The Authority was also awarded \$929 million of FY 10 Grant funding to support construction and electrification components in the Central Valley. The Authority expects to begin expending these FY 10 Grant funds in 2024.
- The Authority received approximately \$600 thousand in brownfields grant funds through the U.S. Environmental Protection Agency (EPA) in 2017. These funds were used for the inventory, characterization, assessment, and conduct of cleanup planning and community involvement related activities around the Los Angeles Union Station area.

FY 21 and FY 22 RAISE Grants

The Authority has already received two new grants from the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) Program, both at or near the maximum award of \$25 million:

- In November 2021, the Authority was awarded a \$24 million RAISE grant for State Route 46. The funds will be used for crucial safety, efficiency and construction projects in and around the city of Wasco. This grant helps bring safety, environmental justice and economic development improvements to a historically disadvantaged community and further demonstrates the federal government's support for this program.
- In August 2022, the federal government awarded the Authority an additional \$25 million RAISE grant for the design advancement of the Merced extension segment. In the same month, the Authority awarded the design contract which covers 33.9 miles with 40 structures. The funding will provide more than half of the expected \$41 million cost for the Madera to Merced design contract. This grant award is a strong affirmation of the federal government's support of the Authority's goal of electrified high-speed trains running between Merced and Bakersfield.

Current Partnerships and Local Funding

The Authority has partnered with other transportation agencies on investments in shared corridors, matching Authority funds with other federal, state and local funds, to bring early benefits to existing passenger rail systems and future benefits for high-speed rail. The Authority worked with partner agencies to combine state, regional, local and federal sources to fund the Caltrain Electrification Project, the Link Los Angeles Union Station (Link US) Project, the completed 25th Avenue Grade Separation

Project in San Mateo and the Rosecrans/Marquardt Grade Separation Project in Los Angeles. Together, these projects have combined budgets of over \$3 billion, of which \$1.3 billion is accounted for in the Authority's capital cost estimate.

Summary of Awarded / Appropriated Funding To Date

Table 3.0 summarizes the total forecasted funding for the project through 2030, how much has been expended through November 2022, and the total remaining funds available. Consistent with our assumptions, the table shows a range for future Cap-and-Trade funds.

FUTURE FUNDING

The passage of the BIL heralds a new beginning of a sustained federal-state partnership in the development of California's high-speed rail program. The high-speed rail system can now be developed in much the same way the Interstate Highway System and regional public transit systems have been built in our state – through a series of multiyear federal, state and regional investments that build out a network in a phased approach. The Authority will aggressively seek competitive grant funds from BIL grant programs with an \$8 billion target. As was previously noted, additional federal funding is needed to build and expand high-speed rail in

Table 3.0: Summary of Total Funding Available and Total Funds Expended as of November 30, 2022
(\$ in Billions)

Funding Source	Total Funding A	Total Expended* B	Total Remaining** C = A - B
Federal Funds			
ARRA Grant – Construction	2.1	2.1	0.0
ARRA Grant – Planning	0.5	0.5	0.0
FY10 Grant + Brownfields Grant + RAISE Grants	1.0	0.0	1.0
State Funds			
Proposition 1A Project Development	0.6	0.6	0.0
Proposition 1A Central Valley Segment Construction	6.8	2.6	4.2
Proposition 1A Bookends	1.1	0.4	0.7
Cap-and-Trade Received through November 2022	5.4	3.7	1.7
Subtotal	17.5	9.9	7.6
Future Cap-and-Trade***	6.0 to 7.7	0.0	6.0 to 7.7
Total	23.5 to 25.2	9.9	13.6 to 15.3

Note: Totals may not sum due to independent rounding

*Excludes administration and other state operations expenditures

**A portion of this funding may be directed to administration and state operations

***Future Cap-and-Trade funding assumes a low of \$0.75 billion to a LAO Base of about \$1 billion per year from February 2023 to December 2030 (8 years)

America. If the federal government were to provide a permanent annual funding program of \$5 billion specifically for high-speed rail, for example, California would look for \$1 billion to \$2 billion a year to continue to build the system.

As we pursue additional federal funds, we will benefit from already having matching dollars from Proposition 1A and Cap-and-Trade funds. The Authority will be uniquely positioned to leverage those state funds with significant federal investments in both the short and long term. Furthermore, California and federal government policy goals are aligned to pursue world-class mobility and reduce greenhouse gas emissions. The Authority's plans to work closely with the California State Transportation Agency (CalSTA) and regional and local partners to provide strong, unified justifications for the grant applications that will comprise a connected California mobility plan for consideration by the federal government. This approach aligns with the Authority taking the lead on applications for key rail funding programs that will deliver its core elements, while supporting an integrated statewide approach that leverages a broader range of federal funding that may be pursued by other agencies to maximize short-term benefits in the integrated system, such as safety, connectivity, improvement of existing regional services, social equity and better air quality. The California High-Speed Rail Project is uniquely positioned to put federal funds to work because:

- The Merced to Bakersfield segment is environmentally cleared; all of it is now in some stage of advanced design; and 119 miles of it are currently in full construction. The time is now to invest federal dollars in this segment.
- The project is advancing now – construction is progressing in the Central Valley and significant progress is being made to environmentally clear the full 500-mile system, with the intent to advance design as each section is cleared.

- We can match federal dollars with state funds – California has the most advanced high-speed rail project in the nation and is ready to put federal dollars and matching funds to work now.
- We can partner with other state and regional projects of significance – the high-speed rail system is the backbone of a modern, integrated passenger rail network that will improve state-wide mobility for all.
- A federal-state partnership enables Californians to realize the goal of a truly connected state. It will also demonstrate how these investments can help achieve critically important greenhouse gas and pollution reduction goals.

The \$15 billion, multi-year transportation infrastructure package approved by Governor Newsom and the State Legislature in June 2022 included funding for high-speed rail program and other clean transportation projects around the state. For example, new state General Fund revenues are helping to fund the Altamont Commuter Express (ACE) and Amtrak San Joaquins connections to the shared station with high-speed rail in Merced. These funds can also help accelerate joint benefit projects in shared corridors, such as new grade separations and the Caltrain electrification project in the Bay Area, to benefit both current passenger rail operators and future high-speed rail. While the projected General Fund deficit in 2023-24 requires actions to close the budget gap, the Governor's January Budget proposes to sustain 85 percent of the transportation infrastructure package investments. It also includes a trigger that will restore the proposed reductions for transit and intercity rail projects if there is sufficient General Funds in January 2024.

New State Funding for Transit and Rail

Even with the Governor's 2023-24 budget proposal to close the projected budget deficit, the 2022-23 budget package still includes:

- Transit and Rail Projects: \$5.7 billion General Fund over four years to invest in high-priority transit and rail infrastructure projects throughout the state. Funding will be administered through the Transit and Intercity Rail Capital Program (TIRCP).
- High-Speed Rail: \$4.2 billion High-Speed Passenger Train Bond Fund (Proposition 1A) to complete high-speed rail construction in the Central Valley.
- Goods Movement and Ports: \$1.2 billion General Fund for port-specific projects that increase goods movement capacity on rail and roadways at port terminals, including railyard expansions, new bridges and zero-emission modernization.
- Active Transportation: \$800 million General Fund and State Highway Account for Active Transportation Program projects that encourage the increased use of active modes of transportation, such as walking and biking, and increase the safety and mobility of non-motorized users.
- Grade Separations: \$350 million General Fund to support critical high priority grade separation safety improvements throughout the state.
- Climate Adaptation Programs: \$200 million State Highway Account to identify transportation-related climate vulnerabilities throughout the state and assist in developing and implementing projects to adapt infrastructure given climate change impacts. The Budget also allocates \$200 million federal funds for these purposes.
- Highways to Boulevards Pilot: \$150 million to establish the Reconnecting Communities: Highways to Boulevards Pilot Program, which will inform the future conversion of key underutilized highways into multimodal corridors that serve existing residents. The program will further the development of complete streets features as outlined in the Department of Transportation's Climate Action Plan for Transportation Infrastructure.
- Clean California Local Grants: \$100 million General Fund in additional funding for the Clean California Program grant program in 2023-24.

Opportunities for Federal Funding

A key component of maximizing new federal funding is to align available federal funding programs to high-speed rail program components and then to identify and secure the non-federal funding match. California's policy priorities are closely aligned with the federal government's goals for targeted investments in world-class mobility and reduced greenhouse gas emissions. These shared policy priorities will help in applying for federal funds for delivering high-speed rail. The Authority has identified more than \$75 billion in funding from the BIL for which the Authority is eligible to compete.

Consistent with the priorities in SB 198, our priority for new federal BIL grants will be the Merced to Bakersfield segment. We also plan to apply for BIL funds to advance design on the remaining project sections from San Francisco to Los Angeles/Anaheim, so they will be one step closer to being ready for construction and more competitive for additional funding in the future – although we will not do so at the expense of completing Merced to Bakersfield.

Table 3.1 displays the primary BIL programs in this category for which the Authority plans to apply.

Table 3.1: Bipartisan Infrastructure Law Grant Programs (\$ in Billions)

Competitive Grants Program	Eligibility/Purpose	Appropriated	Additional Authorization ¹	Total ¹
Federal-State Partnership for Intercity Passenger Rail Grants (F-S PIPR) (excluding the Northeast Corridor set-aside)	High-speed rail and all intercity rail expansion projects Multiyear commitments possible	\$12.0	\$4.1	\$16.1
Consolidated Rail Infrastructure and Safety Improvements (CRISI)	Capital projects that will improve passenger and freight rail transportation systems in terms of safety, efficiency or reliability	\$5.0	\$5.0	\$10.0
National Infrastructure Project Assistance Program (NIPA) (Megaprojects)	Broad eligibility for different types of infrastructure	\$5.0	\$10.0	\$15.0
Local and Regional Project Assistance Program (L&R) (RAISE Grants)	Invest in roads, rail, transit and port projects to achieve national objectives	\$7.5	\$7.5	\$15.0
Nationally Significant Multimodal Freight and Highway Projects (INFRA Grants)	Fund highway and freight projects of national and regional significance Available for rail/highway crossing projects	\$3.2	\$6.0 (Authorization) and \$4.8 (Contract Authority)	\$14.0
Federal Railroad Administration Railroad Crossing Elimination Program	Highway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods	\$3.0	\$2.5	\$5.5

Key to Terms:

Appropriated - Funds are appropriated in the legislation. Authorized - Funds can only be released upon future appropriation by Congress. Contract Authority - Funds come from the Highway Trust Fund and do not require appropriations to be released.

Notes:

¹ Final FY22 and FY23 federal appropriations fell below the additional authorized amounts in the BIL.

Authority Federal Funding Strategy

In 2008, California voters approved Proposition 1A to provide initial funding for the nation's first high-speed rail system. Subsequently, the Authority received the ARRA grant and FY10 grant, initiating a long-term partnership between the federal government and state of California. We still consider the federal government to be a critical partner in the ongoing development of the California high-speed rail system. As such, we have engaged with United States Department of Transportation (U.S. DOT) and the FRA from the inauguration of the Biden Administration, to rebuild this important relationship. We have used multiple discussions with federal representatives to describe the status of the program, its challenges and needs, and plans for its continued development in the spirit of transparent communication. As the BIL was proposed, and then passed, we have been highly focused on understanding and analyzing the funding programs within it that could provide further resources to program expansion. The result is an Authority federal funding strategy

that aligns very closely to federal policy goals and that we believe can meaningfully contribute to the further development of this program. The federal strategy has been built on four key principles:

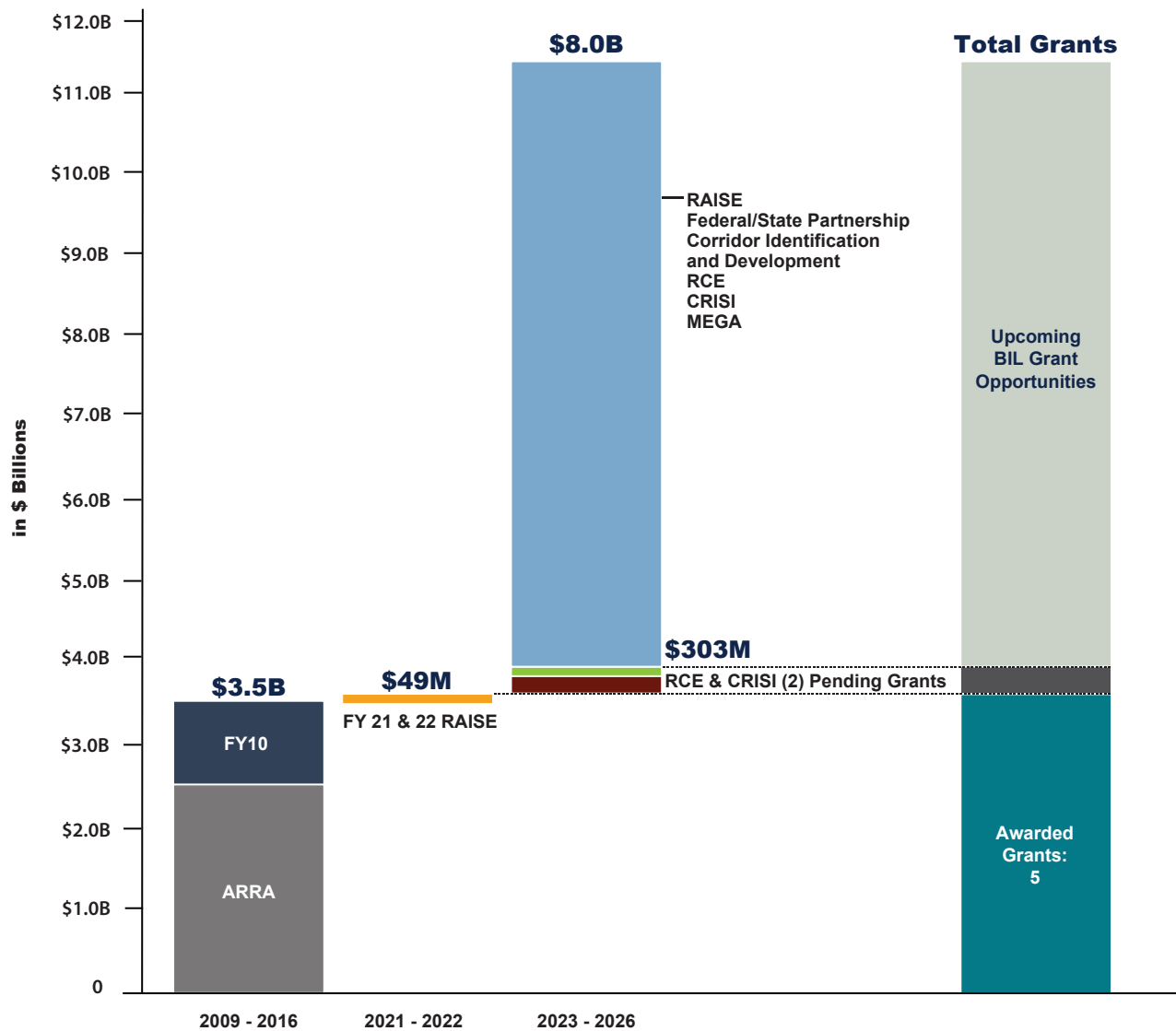
1. Build on previous federal investments.
2. Advance and align with federal policy goals.
3. Optimize the leveraging of federal and state funds.
4. Support both Authority-led projects and components led by partners.

The strategy is designed to elicit the following outcomes for the high-speed rail program:

- Deliver the nation's first true high-speed rail system starting with Merced to Bakersfield service;
- Prepare for systemwide delivery by advancing project development; and
- Make targeted early investments with near-term benefits.

Exhibit 3.2 is the Authority's federal funding roadmap that summarizes the federal fund awards it has received to date and the target new federal funding award of about \$8.0 billion from upcoming BIL grant opportunities through 2026.

Exhibit 3.2: Summary of Federal Funding Roadmap

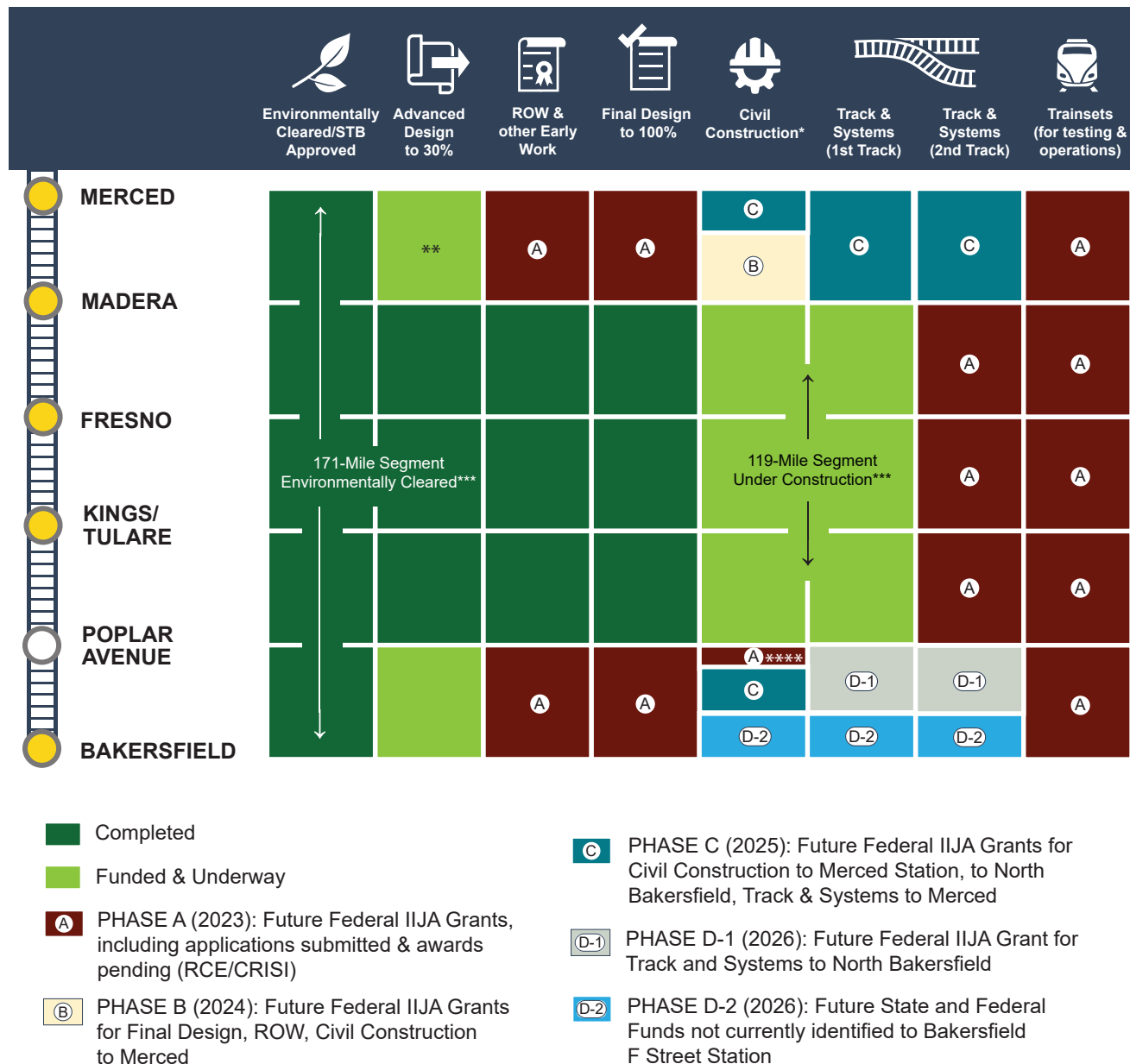


PHASING APPROACH FOR FEDERAL GRANTS

The Biden-Harris Administration has set a vision to demonstrate high-speed passenger rail service in America with the BIL programs. The Authority has targeted about \$8.0 billion in new funding from BIL programs, which would bring the federal funding total to \$11.5 billion, or a 35% federal contribution to the state's 65%. A continued strong federal

partnership is essential to delivering the high-speed vision in California and nationally. Anticipating multiple awards and multi-year funding agreements over the five-year BIL program, the Authority is presenting a Merced to Bakersfield passenger service phased approach for grant applications, which is illustrated in **Exhibit 3.3**. The phasing plan places work at the front end that is at the schedule critical path for the 2030 passenger service goal.

Exhibit 3.3: Merced to Bakersfield Phasing Approach for Federal Grants



*Full Stations Build-out will be separately procured from Civil Works Construction.

**2022 RAISE Award

***ARRA, FY 10, 2021 RAISE Grants

****2022 RCE & CRISI Application (6 Grade Separations in Shafter)

Consistent with the Merced to Bakersfield Business Case Assessment Study (February 2020) conducted by KPMG, the extensions to Merced and Bakersfield can be advanced incrementally by segment. The Merced Extension is also prioritized given the connectivity benefits with San Joaquins and ACE passenger rail services serving Northern California population centers of San José, Oakland, and Sacramento.

Other Potential Funding Sources

Additionally, the California high-speed rail program advances a range of transportation-adjacent federal policies, such as energy grid resilience, renewable energy, value capture from transit-oriented development (TOD), broadband connectivity and social equity, as well as partner transportation agencies. There are a range of potential federal programs in these transportation-adjacent sectors, outside of what might be conventionally thought of as high-speed rail funding, that the Authority could apply for that could provide near-term benefits and that advance a range of policy objectives.

OPTIMIZING FEDERAL FUNDS WITH MATCHING FUNDS

Federal funding generally comes with a requirement for a non-federal match. This could comprise state, regional, county, city and private funds, often combined together, as we have successfully demonstrated on our regional bookend projects. As part of our future funding strategy, we are analyzing opportunities for matching funds. Currently identified funding sources, such as Cap-and-Trade and Proposition 1A, provide substantial match funding for future federal grants.

With an ongoing federal commitment to building high-speed rail in the United States, the potential future funding opportunities discussed below could provide the match for longer-term federal funding to extend high-speed rail beyond the Central Valley to the Bay Area and to further advance high-speed rail investments in Southern California.

Extending State Cap-and-Trade Funding

Over several prior reports and business plans, we have discussed the benefit of extending the Cap-and-Trade program. This would not only provide long-term revenue for the Authority but would also provide additional funds for wider California social and climate policies, such as local transit and wildfire prevention, that are funded through other programs. Extending the Cap-and-Trade Program to 2050 would be consistent with the state's adopted GHG reduction objectives and policies and generate \$40 billion to \$80 billion in additional funding for the state's Greenhouse Gas Reduction Fund and could provide an additional \$10 billion to \$20 billion in future funding for high-speed rail.

These projections are based on total state Cap-and-Trade revenues generating between \$3 billion (Authority's Low Case) to \$4 billion (LAO Base Case) per year and on the Authority maintaining its current 25% continuous annual appropriation (for \$750 million to \$1 billion per year). With a Cap-and-Trade extension, we would likely accelerate access to these funds through municipal financing, which would provide funds earlier so that we could put them to work sooner to help build out the system. To facilitate an efficient financing effort, the Cap-and-Trade Program would need to be enhanced in three critical ways:

1. Extension of the Cap-and-Trade program through 2050;
2. Non-impairment of appropriations to the California High-Speed Rail Authority; and
3. State minimum guarantee of annual funds for California High-Speed Rail Authority.

An extension and potential financing of Cap-and-Trade represents the next tranche of state funding to match the range of federal investments that the Authority expects to receive. Additionally, the Authority would work with the U.S. DOT on financing programs, such as the Transportation Infrastructure Finance and Innovation Act (TIFIA) and the Railroad Rehabilitation and Improvement Financing (RRIF). As stated above, these funds could be effectively combined with ongoing federal funds to extend high-speed rail to the Bay Area and further advance high-speed rail investments in Southern California. Creating a strong and stable revenue stream on the state side provides the strongest possible indication to the federal government that the Authority is ready to take full advantage of federal financing programs.

Local and Regional Funding

Funding opportunities multiply in shared corridors where passenger rail service is currently provided by regional rail operators and the corridors will be shared with high-speed service in the future. In these cases, broader opportunities exist for local and regional funding to match a broader suite of federal grant programs. Seeing this opportunity, the Metropolitan Transportation Commission adopted the Plan Bay Area 2050 Final Blueprint in 2021. This \$1.4 trillion plan includes capital improvements, such as electrification, grade separations and other modernization projects. It also includes more than \$7 billion of investments south to north along the Caltrain/high-speed rail shared corridor that prioritize dual-purpose investments that help to connect high-speed rail to the Bay Area.

Additionally, the high-speed rail system will generate regional and local value. As such, we could also seek funding linked to this value by focusing on station area value capture and the appreciating real estate values that the system will help create. The full value of the asset will be realized by using innovative methods of value capture, such as secondary use of the system's right of way to provide fiber-optic communication connectivity. Many of these secondary uses align closely to state and federal policies. Ancillary revenues and transit-oriented development will provide further sources of funding that can contribute to system expansion or other costs which may be accessed through partner agencies or directly.

Private-Sector Finance

No private funding is currently being used for the California high-speed rail system. It is the Authority's intent and objective to secure private investment in the high-speed rail program. It is not a matter of whether the Authority will pursue private partnerships, but when. The Authority believes that private sector partners will invest in the construction and operation of the system once risks, returns and system operations are better understood and more advanced than where they are today.

Monetizing the Silicon Valley to Central Valley Line

A fundamental goal of the program is to create a commercially successful and financially sustainable high-speed rail system. Once the Silicon Valley to Central Valley line is built and in operation, it will become a viable commercial enterprise, generating revenue and producing positive cash flow. Upon

demonstrating a level of operational maturity, this positive cash flow can be monetized through financing and private investment, which can then help fund future development of the system. As demonstrated in other high-speed rail markets, including California/Nevada's Brightline West project, private-sector operators are expected to invest a considerable amount to own the rights, through a concession, to the long-term operations of a commercially viable high-speed railway.

Funding a High-Speed Rail Megaproject

California's high-speed rail project is unique in its magnitude and its complexity for the United States. We are funding and implementing it in the same way that high-speed rail systems have been, and continue to be, developed throughout the world. Specifically, we have a clear, long-term vision and a long-term plan for implementing that vision. We are advancing it through a series of phases allowing for incremental extensions. That is the implementation strategy that we laid out in our 2012 Business Plan and that we continue to follow. We recognize that, given the project's magnitude, all the funds will not be available in one single installment and that we will have to build the system sequentially, demonstrating progress and value incrementally. We are in the process of doing this and looking to the next step in this program while focusing on delivering the current elements of it.

CAPITAL COSTS

This section presents an updated cost estimate for the 171-mile high-speed rail segment connecting Merced, Fresno and Bakersfield. As the first operating segment for passenger service, this segment will lay the foundation for connections to the Bay Area and the Los Angeles Basin. It also presents a detailed update of the cost estimate for the 119-mile Central Valley Segment between Madera and Poplar Avenue (north of Bakersfield) where construction is well underway. Cost estimates for the Northern and Southern California sections, including an updated estimate for the San Francisco to San Jose project segment, are also presented along with a revised estimate for the full 500-mile system linking San Francisco to Los Angeles/Anaheim (Phase1).

Capital Cost Estimates for Merced-Bakersfield Early Operating Segment

When the Legislature approved the final \$4.2 billion in Proposition 1A Bond funds for the high-speed rail program in 2022, it directed that the Authority provide a comprehensive update in the 2023 Project Update Report of the cost estimates for the Merced to Bakersfield segment. The Legislature also enacted Senate Bill 198 (SB 198), which defined the scope of the "Merced to Bakersfield segment" as a 171-mile electrified dual-track segment that is usable for high-speed rail service in the Central Valley from Merced to Bakersfield, with a new intermodal station in downtown Merced, and connections to the Amtrak San Joaquins and the Altamont Corridor Express. During hearings last year, the Legislature brought up the 40-year high global inflation as a concern for project costs and asked that the 2023 Project Update Report include appropriate updates for inflation as well as other changes that may have occurred to each cost element of the Merced to Bakersfield segment since costs were last updated. Those updates are all included in this cost section.

This section first provides the updated cost estimates for the 119-mile Central Valley Segment currently under construction (Construction Packages 1, 2-3, and 4). As discussed in prior reports, construction contracts were executed at an early stage of development due to federal deadlines to expend ARRA grant funds. Construction was started with only 15% design completed and limited right-of-way acquired. The Authority did succeed in fully drawing down the ARRA grant funds in accordance with the federal schedule. However, that approach, combined with unresolved regulatory issues and third-party agreements, resulted in significant scope additions and costs beyond what was originally assumed. The Authority now has over 96 percent of right-of-way in hand, completed the design of the 119-mile civil infrastructure, and has completed over half of the utility relocations.

The new estimates for this existing construction work represent updates from having final design elements incorporated into the construction contracts via change orders, additional risk contingency and updates due to high-levels of global inflation and revised construction schedules.

The next part of this cost section focuses on the Merced and Bakersfield extensions, the track and systems work, stations, and trainsets. Construction contracts for these elements will be procured in the future. The Authority is already approaching the extensions differently by advancing design to the configuration-level, which is generally about 30 percent (as described in Chapter 1 of this report) at which point we are able to start acquiring right-of-way. Consistent with the staged project delivery approach, this allows the Authority to advance early-work activities sooner: advance geotechnical work; identify and establish third-party agreements; and begin utility relocations.

The extensions to Merced and Bakersfield include some significant scope additions, due to both experience on the current construction segment, and scope added consistent with Legislative direction and by engaging with local communities and third parties on station locations and other matters. Also, in 2022, the Authority decided to restart the track and systems procurement after determining that COVID-19, global inflation and supply chain uncertainties increased costs and changed contracting approaches in the industry. The cost estimates also account for escalation due to extended schedules and high global inflation that are impacting all infrastructure projects nationally and abroad. Further, the cost estimates present a range of risk, which the Authority presents below ranging from a probability level of 30% to 65%.

Estimating Methodology

Developing the updated estimates for the Merced to Bakersfield project involved conducting extensive workshops with department leads on scope, schedule, cost, and risk, running independent risk modeling, and then conducting thorough reasonableness checks. Specifically:

- Cost estimates were prepared following the Capital Cost Estimating Guidance from Federal Railroad Administration (FRA), the General Accountability Office (GAO), and the Association for the Advancement of Cost Engineering (AACE) which provide recommended practices on cost estimating;
- A risk process was conducted by the Authority's independent risk advisors (Ernst & Young) following the Federal Transit Administration's (FTA) Oversight Procedure for Risk and Contingency setting; and
- Reasonable checks were conducted on major projects of the estimate by the Authority's Financial Advisor (KPMG).

As has been regularly reported to the Authority's Board of Directors by the CEO, several important work efforts needed to be completed to gain better clarity on the scope of the project before a more comprehensive update on cost and schedule could be prepared, including:

- Executing major outstanding change orders to further define scope for Construction Packages 1-4;
- Updating and issuing a revised right-of-way schedule for Construction Packages 1-4; and
- Developing revised baseline schedules for the Construction Packages.

Updated Capital Cost Estimates – Merced to Bakersfield Segment

The Authority's cost updates are occurring in a difficult global environment for large projects. A major intercity rail mega-project recently announced a 39% budget increase from \$11.6 billion to \$16.1 billion. This is the Gateway Project on the North-east Corridor. On January 31, 2023, President Biden celebrated federal funding for this project, noting "This is just the beginning, the beginning of finally constructing a 21st-century rail system."

California is facing similar challenges to the Gateway Project. Our costs for this segment are growing from \$25.7 billion to a cost range based on probability level ranging from \$32.1 billion (P30) to \$35.3 billion (P65). That equates with cost growth of \$6.5 billion to \$9.7 billion, for an increase of 25% to 38%, at P30 to P65 respectively.

Our cost drivers can be grouped into three categories, with costs indicated at the higher, or P65, level:

- Escalation / Inflation: Higher costs due to higher inflation rates and time impacts add about \$2.1 billion, or about 21% of new costs.
- Scope Increased or Transferred: New scope elements added to the Central Valley, as agreed upon by stakeholders, including the legislatures and local partners, include extensions in

Merced and Bakersfield for preferred downtown station locations, final scope for the 119-mile segment, revised station designs, dual-tracking, and solar power elements. Some elements are brought into the Central Valley from other Phase I costs, such as the light maintenance facility and elements of the Bakersfield Station. Scope changes add about \$3.9 billion, or 40% of new costs.

- Contingency and Other: The above adjustments result in additional contingency required to achieve a P65 risk level. Other includes updated right-of-way and professional services, with some elements of each of those also related to escalation and scope. Costs here add about \$3.7 billion, or about 39% of new costs.

The cost growth can also be described by sequence. First, the cost to finishing the existing civil work on the 119-mile segment – work that is already under contract and underway. Second the cost of what will largely be new contracts to complete the Merced to Bakersfield segment, including construction contracts, track and systems contracts, and trainset procurement.

- Finishing the 119-mile Construction Segment:
 - The Authority now has over 96 percent of right-of-way in hand, has completed design of the civil infrastructure, and has completed 53% of the utility relocations, with another 19% under construction. The new estimates for this existing construction work represent updates from major final design elements being incorporated into construction contracts via change orders and updates due to global inflation and new construction schedules. To complete current civil contracts and related work, \$2.2 billion is added at the P65 level.

- New Contracts/Work to Complete Merced to Bakersfield:
 - ▶ The Authority is also looking towards new procurements for civil construction to Merced and Bakersfield, the track and systems work, stations, and finally trainsets. We are already approaching the extensions differently by advancing design to the configuration-level, which is generally about 30 percent, and will procure right-of-way in advance of construction work.
 - ▶ Cost updates for new contracts are informed by market conditions, including inflation, and updates to unit costs and scope such as station location and designs. To complete through Merced to Bakersfield, an additional \$7.5 billion is added at the P65 level.

Table 3.2 shows the capital projects and the program management support necessary to complete the work on the 119-mile Central Valley Segment at the scope definition that generally matches both the 2022 Proposition 1A Funding Plan and the federal grant scope. That is followed by **Table 3.3** that displays the entire cost to develop the operating segment between Merced, Fresno and Bakersfield. The tables show the 2022 Business Plan estimate, the Year-of Expenditure (YOE) cost estimates and the risk ranges between a confidence level of 30 percent to 65 percent ("P30 or P65"). The YOE estimate is a critical part of the risk process. It is a stripped and adjusted base estimate which starts from a number that is free of risk and serves as the basis for developing a risk range. The Authority is establishing a budget that corresponds to a P65 level of contingency that aligns with guidance from the federal government; however, the Authority's goal is to manage within the P50 threshold for all projects (see FTA [Oversight Procedure 40 – Risk and Contingency Review](#))

Table 3.2: 119-Mile Central Valley Segment Cost Estimates Compared to 2022 Business Plan (YOE\$ in millions)

Scope Element	2022 BP	Estimate YOE	P30	P50	P65
Central Valley Civil Construction	10,255	11,485	12,246	12,357	12,455
Track & Systems - Single Track	2,362	2,722	3,236	3,541	3,813
Program Management & Support (Construction)	687	686	728	743	769
Project Reserve	46	46	46	46	46
Interim Use	162	162	162	162	162
Program Wide Unallocated Contingency	420	0	318	368	410
Subtotal Construction	13,932	15,101	16,736	17,217	17,655
Project Development, Management and Support	574	544	575	589	607
Total Central Valley Segment:	14,506	15,645	17,311	17,806	18,262

Table 3.3: 171-Mile Merced to Bakersfield (and other Phase 1) Capital Costs (YOE\$ in millions)

Scope Element	2022 BP	Estimate YOE	P30	P50	P65
Central Valley Segment	14,506	15,645	17,311	17,806	18,262
Project Development Balance	127	127	127	127	127
Merced Extension	2,397	3,172	3,780	4,140	4,462
Bakersfield Extension	1,232	2,301	2,752	3,020	3,258
Stations	242	875	1,044	1,147	1,237
Track & Systems Balance (Including CVS Second Track)	1,615	2,162	2,569	2,810	3,025
Solar and Utility Interconnection	0	165	196	214	230
Trainsets (6 total)	673	379	465	516	561
Maintenance Facility and Driving Simulator	18	273	342	382	418
Program Wide Support and Contingency Balance	905	1,123	1,249	1,336	1,396
Phase1 Transfer (Ph1)	1,719	0	0	0	0
Subtotal Merced to Bakersfield:	23,434	26,222	29,833	31,497	32,976
Project Development Balance (Ph1)	541	522	539	545	559
Program Wide Support Balance (Ph1)	393	428	458	475	490
Bookend	1,298	1,298	1,298	1,298	1,298
Total:	25,667	28,470	32,127	33,815	35,323

The updated cost estimates reflect a greater level of precision, as we have updated and refined the quantities, pricing, and escalation rates used to build an updated estimate.

The risk process is based on extensive efforts undertaken by the Authority's independent risk management team, which consisted of subject matter

experts throughout the Authority, and involved multiple risk workshops to support the data used for the modeling. This approach is consistent with the federal guidance mentioned above and industry leading practices.

Key Updated Assumptions

Assumptions reflect updates requested by local partners and the legislature including:

Stations

- **Bakersfield Station:** The prior estimate assumed an interim terminal station located north of downtown Bakersfield. This estimate now assumes the elevated F Street Station in downtown Bakersfield, consistent with the approved environmental document (Locally Generated Alternative), extending the four-track viaduct structure through the end of pocket track south of F Street Station platform. This scope change added \$1.195 billion to the cost of Bakersfield Extension.
- **Merced Station:** The prior estimate assumed an at-grade station located between G Street and Martin Luther King Jr. Way. This estimate reflects an extension to downtown Merced, between O Street and R Street, and an elevated multimodal station with connections to Amtrak San Joaquins and Altamont Corridor Express (ACE) trains. It is currently undergoing an environmental reexamination. This scope change added \$960 million to the cost of the Merced Extension.

- **Kings/Tulare Station:** This station was changed from an at-grade station to an elevated station consistent with the Hanford Viaduct change implemented within the CP 2-3 project section.

The station quantities have been updated for consistency with current programming of the station facilities. Specifically, the current station estimates now include more comprehensive station facilities (including signature canopy structures, photovoltaic panels, misting systems, enclosed spaces and parking facilities) that were not fully included in 2022 Business Plan cost estimates, which was based on an incremental approach to station delivery.

The station renderings show that the Merced and Bakersfield station scopes have changed – they are now on elevated structure and located in their respective downtowns.

Operational Elements: Track, Systems, Trainsets and Operations Facilities

As discussed in Chapter 1, the Authority is undertaking a systematic review of its approach to procuring and delivering key operational elements including the track and systems. We have benefited from the



Renderings: Merced and Bakersfield elevated stations



industry feedback we have received as part of this review and refined our estimates accordingly. The updated costs represent a comprehensive update for this element in both the material quantities and unit costs including the cost associated with startup and commissioning of these systems.

The scope of the trainsets procurement to support the passenger service remains unchanged and includes 6 trainsets in total – 2 prototype trainsets plus 4 production trainsets.

The scope of the initial maintenance facilities has been expanded to include the following elements:

- Train simulator (scope/cost was previously included in the trainset cost estimates)
- Trainset Certification Facility (required during testing and commissioning phase)
- Light maintenance level facility as the initial facility required to support the first 5 years of operations

CAPITAL COST ESTIMATES – NORTHERN CALIFORNIA

Since the release of the 2022 Business Plan, the Authority has achieved a Record of Decision on the San Francisco to San Jose environmental document and updated the capital costs for that section. The cost changes in the San Francisco to San Jose segment, as reflected in the approved environmental document, include increases in right-of-way acquisition costs for the expanded footprints at Millbrae Station and at the light maintenance facility at Brisbane. They also include Caltrain corridor improvements necessary to accommodate 110 mph maximum operating speeds, and related increases in professional services and contingencies. This section is still at the 15% design level. As design is advanced, cost optimizations (savings) are typically identified through, for example, activities like value engineering.

Table 3.4 provides the capital cost estimate ranges in Northern California by section. The cost ranges represent the accuracy of the estimate as a Class 4 estimate based on the Association for the Advancement of Cost Engineering (AACE) cost classification system as applied to projects that have advanced to about the 15% design level.

Table 3.4: Northern California Capital Cost Estimates (YOES in millions)

Scope Element	Low	Base	High
	Northern California		
San Francisco to San José	3,936	4,967	6,407
San José to Gilroy	4,075	6,020	8,733
Gilroy to Carlucci Road	10,316	13,627	16,762
Central Valley Wye Balance	1,842	2,240	2,601
Preliminary Design - Northern California	213	213	213
Bookend Investments	798	798	798
Total	21,180	27,865	35,514

CAPITAL COST ESTIMATES – SOUTHERN CALIFORNIA

The capital cost estimates for the Southern California sections remain unchanged, however, scope related to the Bakersfield F Street Station has been shifted to the Merced to Bakersfield Section from the Bakersfield to Palmdale Section. That resulted in no net cost change, but does reduce the costs indicated for the Bakersfield to Palmdale Section. Additionally, the Authority’s Bookend projects contribution (Link US, Rosecrans-Marquart Grade Separation) is now allocated to the Southern California estimates. This change is to be able to clearly differentiate between the cost estimate for delivering the Merced to Bakersfield project and the cost estimates for delivering Southern California projects.

Table 3.5 shows the capital cost ranges in Southern California by section. The ranges represent the accuracy of the estimate as a Class 4 estimated per the Association for the Advancement of Cost Engineering (AACE) cost classification system based on the 15% design progression completed at this point in project development.

The draft environmental document for the more than 30-mile Palmdale to Burbank section was released in September 2022 with the most up-to-date scope for the section. If the final environmental document contains cost estimates similar to the draft report, that section would carry a cost estimate close to the top of the current cost range. The base cost and cost range for that section will be further updated in the 2024 Business Plan to reflect the final environmental document, including increased costs of additional scope added since the base estimate was developed with input from local communities and other stakeholders, and escalation/inflation impacts.

OTHER PROGRAM WIDE CAPITAL COST ESTIMATES

Table 3.6 shows the other program wide costs required to implement the full 500-mile system beyond the Merced to Bakersfield project include acquiring the remaining trainsets (66 total), completing the heavy maintenance facility in the Central Valley, continuing project development in Northern and Southern California sections, and program management support. Specifically:

- The heavy maintenance facility balance cost estimate is lower than the 2022 Business Plan estimate, reflecting a scope shift in order to make a higher initial investment in this facility as part of the Merced to Bakersfield project.

Table 3.5: Southern California Capital Costs (YOE\$ in millions)

Scope Element	Low	Base	High
	Southern California		
Bakersfield to Palmdale	13,712	17,140	20,740
Palmdale to Burbank	12,635	16,775	24,428
Burbank to Los Angeles	2,201	2,935	3,405
Los Angeles to Anaheim	2,478	2,918	3,352
Preliminary Design - Southern California	382	382	382
Bookend Investments	500	500	500
Total	31,908	40,650	52,807

- The cost of acquiring the balance of trainsets required for expanding operations beyond the Central Valley remain unchanged from the estimate presented in the 2022 Business Plan.
- The Project Development and Program Management costs outside of Merced to Bakersfield section have been updated and are now represented separately.

Table 3.6: Program Wide Capital Costs (YOE\$ in millions)

Scope Element	Low	Base	High
	Program Wide		
Project Development & Support	1,049	1,049	1,049
Heavy Maintenance Facility Balance	248	275	301
Trainsets Balance	4,161	4,643	5,084
Solar Power Generation Balance	166	184	202
Total	5,624	6,151	6,636

Table 3.7 shows the cost estimates for the full 500-mile system with all the cost updates described in this section incorporated. The Merced to Bakersfield capital cost estimate is presented as a range representing the P30 (Low), P50 (Base), and P65 (High) confidence levels, while the remaining program capital cost estimates are presented as ranges, with a Base estimate and ranges based on AACE guidance appropriate for their level of design.

Table 3.7: San Francisco to Los Angeles/Anaheim (Phase I) Capital Cost Estimates (YOE\$ in millions)

Scope Element	Low	Base	High
	Phase I Program		
Merced to Bakersfield	29,833	31,497	32,976
Northern California	21,180	27,865	35,514
Southern California	31,908	40,650	52,807
Program Wide	5,624	6,151	6,636
Total	88,545	106,163	127,933

PROGRAM AFFORDABILITY

Prior sections of this chapter discuss funding and costs to achieve: (1) environmental clearance for all Phase I segments from San Francisco to Los Angeles / Anaheim, (2) complete bookend project commitments, and (3) high-speed passenger service between Merced and Bakersfield.

The Authority does not have stable and predictable revenue at either the state or federal level, as discussed earlier in this chapter – that revenue range is from \$23.5 billion to \$33.2 billion. To get to the high end, Cap-and-Trade revenues must continue at the higher levels observed during the prior two years, and the Authority's new federal grant target of around \$8 billion from Bipartisan Infrastructure Law programs must be achieved. To achieve high-speed rail nationally, the federal government ultimately needs to follow the Bipartisan Infrastructure Law with a permanent high-speed rail funding program of a magnitude that would fund a state like California \$1 billion to \$2 billion per year. In California, the Cap-and-Trade Program currently expires in 2030, but an anticipated extension would continue State funding for the Authority likely in the \$1 billion annual range.

Costs for large capital projects are also defined as a range, due to variables that include several factors beyond the Authority's control, such as future inflation levels and industry conditions. In the cost section we show a P30 to P65 cost range, which ranges from \$32.1 billion to \$35.3 billion.

This uncertainty of funding and costs presents challenges, but this is not new, as the Authority has never had permanent or stable funding at either state or federal level. Significant progress has been made despite this challenge. To meet the challenge going forward, the Authority will aggressively pursue new federal grants from the BIL and beyond. We have also developed a phased approach to keep the project advancing in increments as funding is secured as illustrated earlier in this chapter. With strong federal support, this approach can maintain progress toward achieving passenger service between Merced and Bakersfield by the end of 2030.

Is the Program affordable – the short answer is “yes”. There are funding streams available now, and other funding options to consider, for federal and state policy makers to build a world-class high-speed rail network in America. While high-speed rail is expensive, it is generally less expensive than the equivalent highway and airport expansion needed to move the same number of people. High-speed rail additionally is the best investment for improving mobility and protecting the environment. The question is: Will it be prioritized to get it done?

How California High-Speed Rail Compares to Britain's HS2 Project and Alternative Investments

Comparison to Britain's HS2. HS2, Britain's new high-speed rail line being built to the northwest from London, is the largest infrastructure project in Europe. Passenger service will begin running on the first 140 miles, connecting London to West Midlands (Phase One), between 2029 and 2033. The estimated cost for this initial line—which includes about 50 miles of tunnels—ranges from \$42 billion to \$54 billion, with the upper range including a contingency. Notably, where California's estimates are expressed in inflated "year of expenditure" dollars, HS2 cost estimates are expressed in "constant" 2019 dollars, making a direct cost comparison difficult. Nevertheless, the current per-mile cost estimate (including contingency) to deliver the Merced to Bakersfield line is approximately \$192 million (YOE\$) compared to approximately \$385 million per mile for HS2 (2019\$), showing that our cost estimates are in line with other international high-speed rail projects while also noting that there are market differences between North America and other countries. The higher per-mile HS2 estimate accounts for those differences as well as the fact that its scope includes 54 trainsets and extensive tunneling, including 26 miles of tunneling in central London.

Comparison to expanding California's highways and airports. In 2019, the Authority estimated what it would take and cost to add the equivalent of the high-speed rail system's people-carrying capacity to the state transportation network by building more highways and airports instead. Our analysis showed that California would need to build about 4,200 more highway lane-miles, add 91 more airport gates and build two new airport runways to provide equivalent capacity to 500-miles of high-speed rail between San Francisco and Los Angeles.

Our updated analysis indicates that these road/airport investments would cost from \$130 to \$215 billion (YOE\$) compared to our updated high-speed rail system estimate which ranges from \$88.5 to \$127.9 billion (YOE\$). What is clear is that high-speed rail is less expensive, more environmentally friendly and is the only investment that supports California's climate goals.

2023 Environmental Status



422 Miles Environmentally Cleared



72 Miles Projected to be Environmentally Cleared in 2023/2025





Photos: Salesforce Transit Center, LA Union Station

Chapter 4: *Advancing Statewide: Progress in the Central Valley, Northern and Southern California*

INTRODUCTION

Throughout 2022, progress has continued across the 171 miles either in development or under construction in the Central Valley, including more than 30 active construction sites and 69 structures or grade separation projects either underway or completed. Beyond laying the foundation for high-speed rail infrastructure, these structures are already improving safety and air quality along the high-speed rail alignment. The recently updated schedules are to complete civil construction on Construction Package 4 by the summer of 2023, on Construction Package 1 and Construction Package 2-3 in 2026. Our intent is to begin installing track and systems as each construction package is complete so that testing on the full 119 miles is underway in 2028. Design is advancing on the Central Valley stations and the northern extension to Merced and the southern extension to Bakersfield.

As the Authority focuses on delivering the Merced to Bakersfield line for early passenger service, significant progress continues in Northern and Southern California, particularly with advancing environmental clearance. With 422 miles of the 500-mile system now environmentally cleared from San Francisco to Palmdale in Los Angeles County, our efforts are focused on completing environmental review of the remaining two project sections in Southern California. Work in these regions also includes partner projects including Caltrain electrification and major improvements at Los Angeles Union Station.

The entire stretch from San Francisco to downtown Los Angeles is scheduled to be cleared by the fourth quarter of 2023, as shown in [Table 4.0](#). After that, advancing design work in environmentally cleared sections is an important next step for this decade to maintain the momentum and be ready for construction as new funding becomes available.

While the Authority's top priority remains the completion of the Merced to Bakersfield early operating segment, moving forward with design in Northern and Southern California allows the Authority to stay true to its commitment to the voters to deliver the full San Francisco to Los Angeles/Anaheim system. Having spent more than \$1 billion to complete this environmental work, the Authority proposes to advance design work on all Phase 1 segments for the following reasons:

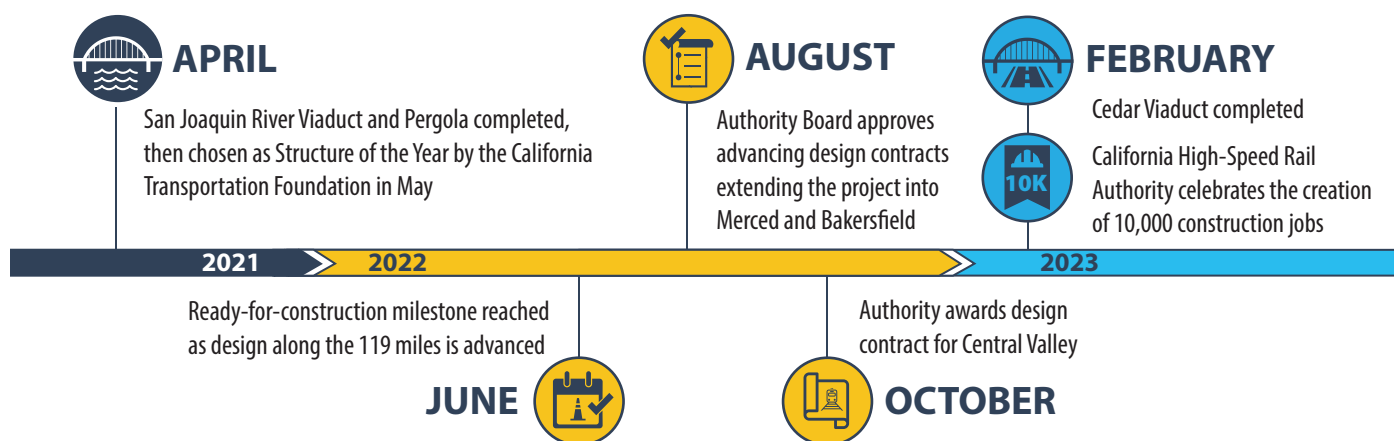
- Advancing design and geotechnical work will provide important information of the constructability of all segments, particularly those with significant tunnelling.

- Advancing design work will enable the Authority to identify right-of-way needs, utility relocations and third-party agreements necessary to construct all of Phase 1.
- Advancing design work will ensure the environmental documents do not go stale and costs for each segment can be verified.

Table 4.0: Progress on Environmental Clearance

Project Section	Status of EIR/EIS
San Francisco to San José	Completed – August 2022
San José to Merced	Completed – April 2022
Merced to Fresno	Completed – May 2012
Central Valley Wye	Completed – July 2019
Fresno to Bakersfield	Completed – May 2014
Locally Generated Alternative	Completed - 2020
Bakersfield to Palmdale	Completed August 2021
Palmdale to Burbank	Draft Published – September 2022 Final Expected – November 2023
Burbank to Los Angeles	Completed – January 2022
Los Angeles to Anaheim	Draft Expected – November 2024 Final Expected – December 2025

Exhibit 4.0: Central Valley Timeline 2021-2023



CENTRAL VALLEY UPDATE – PROGRESS AND MILESTONES

We continue to make steady progress on the 119 miles under construction. **Exhibit 4.1** shows the goals we achieved as of December 2022 and our projected goals for 2023. Design is now 100% complete across all three Construction Packages (CP 1, CP 2-3, CP 4). The complete design includes Author-

ity-approved design packages for structures and guideway. In addition, right-of-way acquisition is 96% complete and utility relocations are 71% complete. Miles of guideway and structures, including grade separations and viaducts, can be seen along the 119 miles under construction between Madera and Kern counties.

A summary of recent milestones in the Central Valley is presented in **Exhibit 4.0**.

Central Valley Construction Dashboard

Exhibit 4.1: Central Valley Construction Progress

		2022	2023 (Projected)
	Authority Approved Design Completed	100%	100%
	Right-Of-Way Parcels Delivered to Contractors	96%	98%
	Utility Relocation Complete/In Progress	71%	83%
	Structures Complete/In Progress	74%	86%
	Miles of Guideway Complete/In Progress	74%	81%
	Overall Contract	66%	72%

10,161 Construction Jobs Created



The increase in construction activity over the past two years contributed to a considerable boost in jobs, from 2,000 construction jobs created in 2019 to now more than 10,000 construction jobs created, as shown above. This steady and significant increase reflects the project's considerable economic impact on a disadvantaged region of California.

The Authority has also made significant investments in Central Valley communities through mitigation measures that align with the project's environmental commitments and policies. Many required stakeholder commitments have contributed to improved local infrastructure throughout the corridor.

Construction Package 1 (CP 1)

Completion of all work in CP 1 is expected by 2026. Several grade separations and signature structures have been completed in CP 1, the 32-mile stretch between Madera and Fresno counties. CP 1 is the first construction contract executed on the 119-mile corridor and extends 32 miles between Avenue 19 in Madera County to East American Avenue in Fresno County. Most notably, the 3,700-foot-long San Joaquin River Viaduct and Pergola was completed in May 2020 and recognized as Structure Project of the Year by the California Transportation Foundation in 2021.

Since 2019, eight high-speed rail grade separations (overpasses) have been completed and opened to traffic in Madera County, improving safety and traffic flow while helping offset greenhouse gas emissions near the high-speed rail corridor. Farther south in Fresno County, the American Avenue Grade Separation was also completed and opened to traffic in 2020.

Throughout the city of Fresno, nearly 300 utility relocations have been completed since 2019, allowing the contractor to begin heavy construction of grade separations along Golden State Boulevard. Work on one significant structure, the Belmont Avenue Grade Separation, began in the summer of 2022 on the west side of the Union Pacific railroad tracks. Additional utility relocations are ongoing along Weber Avenue in preparation for construction on the westside of the overpass.

Before construction started at Belmont Avenue, the Authority hosted two virtual community meetings in both English and Spanish to inform residents and business owners of construction activities and project schedule. Ongoing project status meetings are also held with the city, county and third-party entities.


Design-build contractor Tutor-Perini/Zachry/Parsons (TPZP) began work on the Cedar Viaduct in the fall of 2018. Now, the structure's signature span of double arches can be seen as drivers travel south

through the city of Fresno along State Route 99. Work on the arches began in the fall of 2021. Each arch spans 179 feet and is nearly 40 feet tall. Nearly 75 cubic yards of concrete was placed for each arch in early 2022. Shortly after, arch cables were installed and stressed, and falsework from beneath the structure along State Route 99 was removed, marking completion of the arches.

The Cedar Viaduct, forecasted to be completed in the first quarter of 2023, will be nearly three quarters of a mile long and carry high-speed trains over State Route 99, and North and Cedar avenues. Structures that have been completed and under construction in this CP are summarized in [Table 4.1](#).

Table 4.1: CP 1 Structures Completed and Under Construction

STRUCTURE NAME	ROW STATUS	UTILITY RELOCATION STATUS	STRUCTURE STATUS
Road 27			
Fresno River Viaduct			
Avenue 15 1/2			
Avenue 15			
Cottonwood Creek			
Avenue 12 HST			
Avenue 12 BNSF			
Avenue 11			
Avenue 10			
Avenue 8			
Avenue 7			
San Joaquin River Viaduct			
Golden State Boulevard Viaduct			
Downtown Fresno Viaduct			
Muscat Avenue			
American Avenue			
Tuolumne Street			

STRUCTURE NAME	ROW STATUS	UTILITY RELOCATION STATUS	STRUCTURE STATUS
Avenue 9			
Tulare Street			
Belmont Avenue			
Ventura Street			
Road 26			
Shaw Avenue			
McKinley Avenue			
Olive Avenue			
Avenue 17			
Church Avenue			
Jensen Trench			
Fresno Street			
Fresno Trench			
Central Avenue			
Herndon HST			
Herndon UPRR			

 COMPLETED
 UNDERWAY
 PENDING

Challenges and Risks

Right-of-way and land rights is a diminishing risk that will remain until all utilities are relocated. In CP 1, key challenges continue to be securing third party approvals on designs and receiving local agency permits for road closures needed to meet the schedule requirements.

We are closely monitoring and managing the following key CP 1 schedule risks: Stanislaus Bridge removals, Herndon Avenue underpass, McKinley Avenue overpass, Belmont Avenue overpass/Fresno Trench and Church Avenue overpass. These areas require significant numbers of third-party approvals to advance the construction work.

Construction Package 2-3 (CP 2-3)

In 2022, the contractor submitted, and the Authority conditionally accepted, a substantial completion date of March 2026 for CP 2-3. Since 2019, three high-speed rail grade separations in CP 2-3 have been completed, along with significant progress made at some of the largest structures in Fresno, Kings and Tulare counties. In total, there are 36 grade separations along this 65-mile stretch of high-speed rail that will improve safety and traffic flow for local communities while reducing noise and air quality impacts. These are part of the Authority's goal to deliver a sustainable and environmentally beneficial mode of transportation by reducing greenhouse gas emissions from idling vehicles.

The South Avenue Grade Separation in Fresno County was completed and opened to traffic in early 2022. Later that summer in Kings County, the Jackson Avenue and Kent Avenue grade separations were completed and opened to traffic. Several additional grade separations between Fresno and Kings counties are on track to open to traffic through early 2023.

Work is ongoing at three of the largest structures in the corridor. In 2022, workers began setting girders needed for the Conejo Viaduct in Fresno County. In addition, more than 900 pre-cast concrete girders needed for the Hanford Viaduct in Kings County are also being set for the superstructure. Farther south at the Tule River Viaduct, work is underway on lower edge beams in preparation for girders to be set in 2023.

To the west of Selma, the Conejo Viaduct, a combination viaduct and pergola structure, is a massive undertaking for design-build contractor Dragados-Flatiron Joint Venture (DFJV) extending nearly 2,000 feet. The viaduct is located on Conejo Avenue, between Willow and Peach avenues, west of State Route 43 in Fresno County.

In 2022, 246 of the 248 pre-cast concrete girders to form the pergola section of the Conejo Viaduct were placed; placement of the remaining girders was delayed because of a moratorium that restricted the contractor from performing any work over the BNSF tracks, and the remaining girders are scheduled to be placed in 2023. Each girder spans nearly 124 feet, weighs more than 159,000 pounds and was manufactured at the DFJV Pre-Cast Girder Facility in Hanford, California – a facility built especially for the high-speed rail project and one that employs 155 workers. When complete, the structure will carry high-speed rail trains over Conejo Avenue and the existing BNSF freight lines.

Structures that have been completed and under construction in this CP are summarized in [Table 4.2](#).

Table 4.2: CP 2-3 Structures Completed and Under Construction

STRUCTURE NAME	ROW STATUS	UTILITY RELOCATION STATUS	STRUCTURE STATUS
Adams Avenue	✓	✓	✓
South Avenue	✓	✓	✓
Kent Avenue	✓	✓	✓
Fowler Avenue	✓	✓	✓
Jackson Avenue	✓	🚧	✓
Kansas Avenue	✓	✓	🚧
Peach Avenue	✓	✓	🚧
Davis Avenue	✓	✓	🚧
Tied Arch (SR-43)	✓	✓	🚧
Conejo Viaduct	✓	✓	🚧
9th Avenue	✓	✓	🚧
Cairo Avenue	✓	✓	🚧
Tule River Viaduct	✓	✓	🚧
Deer Creek Viaduct	✓	✓	🚧
Avenue 56	✓	✓	🚧
Avenue 24	✓	✓	🚧
Elkhorn Avenue	✓	🚧	🚧
Dover Avenue	✓	🚧	🚧
Idaho Avenue	✓	🚧	🚧
Mountain View Avenue	✓	🚧	🚧
Avenue 88	🚧	✓	🚧
Kings River Structure	✓	🚧	🚧
Excelsior Avenue	✓	🚧	🚧
Flint Avenue	✓	🚧	🚧

STRUCTURE NAME	ROW STATUS	UTILITY RELOCATION STATUS	STRUCTURE STATUS
Fargo Avenue	✓	🚧	🚧
Hanford Viaduct	✓	🚧	🚧
Grangeville Boulevard	✓	🚧	🕒
Hanford Armona	✓	🚧	🕒
Jersey/SR 43	✓	🚧	🕒
Manning Avenue	✓	🚧	🕒
Lansing Avenue	🚧	✓	🕒
Floral Avenue	✓	✓	🕒
Alpaugh Angiola Atwell Trail (AAAT)	✓	✓	🕒
Cole Slough	✓	✓	🕒
Access Road	✓	✓	🕒
Dutch John Cut	✓	✓	🕒
Whitley Avenue	✓	✓	🕒
Avenue 156	✓	✓	🕒
Stoil Spur	✓	✓	🕒
Cross Creek	🚧	✓	🕒
Houston	✓	🚧	🕒
Avenue 36 Culvert	✓	🚧	🕒
Avenue 120	✓	🚧	🕒
Lakeland Bridge	✓	🚧	🕒
Alpaugh Bridge	✓	🚧	🕒
Curved Bridge	🚧	🚧	🕒
Nebraska	🚧	🚧	🕒
Corcoran Highway	🚧	🚧	🕒

**COMPLETED****UNDERWAY****PENDING**

Challenges and Risks

The key challenges and risks to completing CP 2-3 on schedule include some right-of-way and land rights, third party approvals to designs and receiving local agency permits for road closures needed to meet schedule requirements.

Working with utilities on the timing for critical power transmission line and irrigation relocations is critical to maintaining schedules. Transmission lines can only be moved in certain work windows, so execution of relocation agreements is important.

Third party approvals for construction work plans at Harlan Stevens Ditch relocation are proving to be critical due to ongoing railroad operations and maintaining operation facilities. A high-risk to the schedule is a pending third-party agreement which is necessary to starting construction at CP Monmouth Track shift, which is a realignment of BNSF tracks between East Rose Avenue and East Kamm Avenue in Fresno County.

Construction Package 4 (CP 4)

CP 4 is expected to be completed in the summer of 2023. In 2022, the Authority reached a construction milestone as the final pre-cast concrete girders were placed in CP 4, signifying that all structures in this 22-mile stretch are now either under construction or complete.

The Poso Creek Viaduct in Kern County was the first structure to be completed in CP 4 in October 2020. Construction included several environmental protections and preventive measures to protect the Poso Creek bed to safely divert wildlife within the project area. In 2021, design builder California Rail Builders (CRB) also completed construction of the Garces Highway and Pond Road structures.

Several structures in Kern County are under construction, including grade separations at McCombs












Road and Merced Avenue, located in the city of Wasco. In 2022, girders were placed to form the superstructure for the Merced Avenue grade separation. The pre-cast concrete girders, produced by subcontractor Con-Fab in Shafter, California, were the largest girders produced in California. Since 2019, the Authority has continued to engage with community members and stakeholders in the City of Wasco.

In November 2021, the Authority announced that it had been awarded a \$24 million federal grant to help create jobs and spur economic development within Kern County and the city of Wasco. The Rebuilding American Infrastructure with Sustainability and Equity (RAISE) grant awarded to the Authority contributes to crucial safety, efficiency and construction projects along SR 46. These projects will improve access to adjacent properties affected by the project, improve roadway access for semi-trailer trucks under a sub-standard freight rail bridge and improve intersection safety along this highway, enhancing economic development opportunities in Wasco.

The Wasco Viaduct is located south of the city of Wasco near Jackson Avenue. As the largest project currently underway in CP 4, it will take the future high-speed rail system over existing BNSF rail lines. The pergola section of the viaduct is nearly complete with all 120 pre-cast concrete girders placed. Crews have also placed concrete to form the edge beams to bring the pergola section together. Ironworkers are working on the structure which will take the high-speed rail alignment from the west side to the east side of the BNSF tracks. When complete, the Wasco Viaduct will span nearly 2,000 feet long.

Table 4.3 summarizes the structures completed and under construction in CP 4.

Table 4.3: CP 4 Structures Completed and Under Construction

STRUCTURE NAME	ROW STATUS	UTILITY RELOCATION STATUS	STRUCTURE STATUS
Garces Highway Underpass			
Poso Creek Underpass			
Pond Road Underpass			
Peterson Road Underpass			
Kimberlina Underpass			
Merced Ave Overpass (grade separation)			
Wasco Viaduct			
SR-46 Underpass			
Pedestrian Underpass			
Poso Ave. Underpass			
McCombs Road Overpass (grade separation)			

 **COMPLETED** **UNDERWAY**

Challenges and Risks

CP 4 will be the first of the three construction packages scheduled to reach substantial completion, currently projected for the summer of 2023. There are three primary risks that could impact the completion schedule, two of which involve the execution of agreements and approvals with third parties (water districts). The third primary risk is the weather.

Water storage districts – critical path activities that remain are the relocation of North Kern Water Storage District’s Canal 9-22 and Semitropic Water Storage District’s Canal P-1030.

Weather risk has materialized due to the heavy rain in late 2022 and early 2023. Because of the relatively short time remaining to complete construction on CP 4, weather could impact the schedule. A major

portion of the remaining work is embankment construction that is scheduled to be completed in early 2023. However, the material cannot be moved and placed during heavy rains.

Creating Jobs, Building the Future in the Central Valley

The daily construction progress that continues across the Central Valley is credited to the hard-working men and women representing the local building trades. As of February 10, 2023, an average of more than 1,000 workers are dispatched to construction sites daily. The increase in construction activity over the past two years has continued to provide good-paying jobs for many Central Valley residents, increasing from 2,000 construction jobs in 2019 to 10,000 construction jobs in 2023. An added benefit is that more than 50% of those workers live in disadvantaged communities.

In 2020, the Authority launched a pre-apprenticeship program called the Central Valley Training Center located in Selma, California, in partnership with the local Building and Construction Trades Council, Fresno County Economic Development Corporation and Fresno Economic Opportunities Commission. The goal is to ensure that people in the region receive the proper training to have the opportunity to access these skilled, good-paying jobs. The training center provides students with customized classroom instruction to help fulfill the labor force training needed to enter apprenticeship programs and work on local construction projects, including high-speed rail.

At the training center, students are exposed to more than 10 different trades and graduate with more than a dozen certifications preparing them for a good-paying union job and the qualifications needed to work for other small businesses and subcontractors. To date, through six cohorts, more than 100 students have completed the pre-apprenticeship training program. The Authority is working to extend this successful program through ongoing and future Central Valley construction.

Ongoing Planning Work and Collaboration with Jurisdictions

Over the past several years, the Authority has advanced station site and access planning work with all the cities along the Central Valley spine. While the Authority is partnering with the station communities on a variety of planning activities along the full 500-mile system, planning work in Fresno, Bakersfield and Kings/Tulare has helped clarify what actions the Authority can undertake in advance of passenger service to provide early benefits to the station communities. This activity, called early site activation, looks at the parcels the Authority owns and how to use them in advance of high-speed rail service and community development.

In 2021, most of this work focused on the Fresno Station. A focus on early site activation led us to consider early usage of the historic Fresno Depot and the old Greyhound site. A diverse stakeholder group provided crucial feedback and priorities to be incorporated into site activities in the next few years:

- 1. Emphasize the distinct character of each station-adjacent neighborhood.
- 2. Connect neighborhoods across high-speed rail tracks through physical bridges as well as

consistent quality and character of public realm improvements.

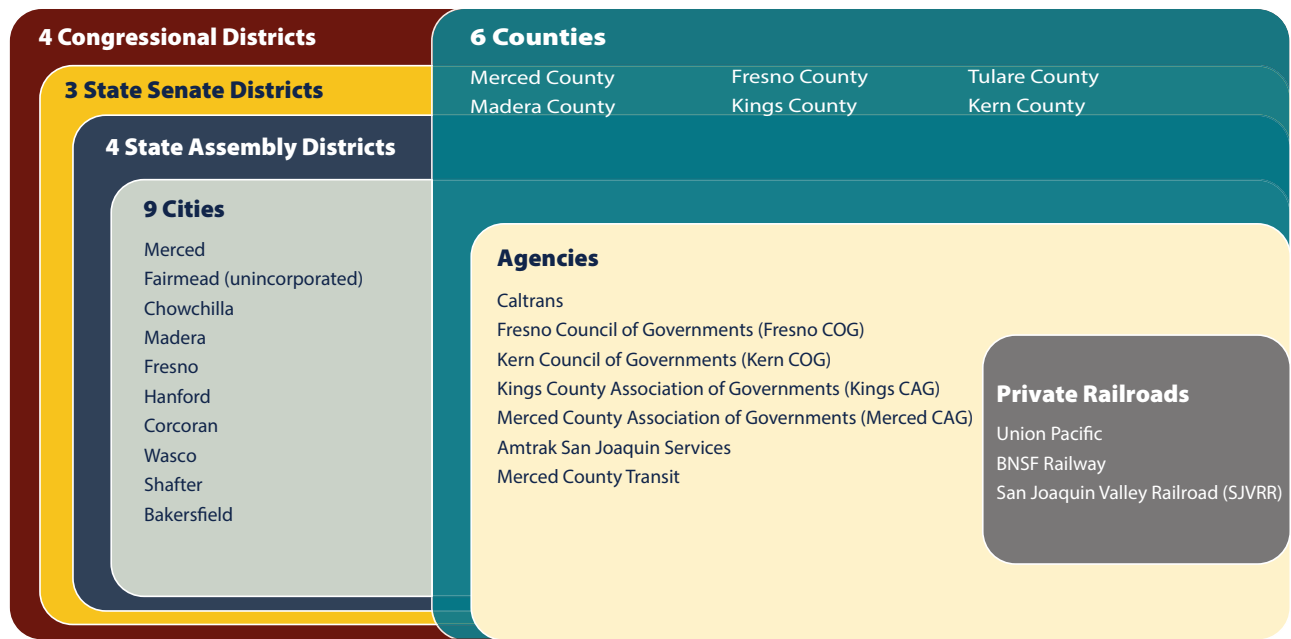
- 3. Activate station sites as soon as possible.
- 4. Maintain regular communication and inclusion in the process to build confidence in outcomes.

More information on planning and design for the Central Valley stations is in Chapter 1.

Continued Outreach and Engagement

The Authority continues to conduct a comprehensive outreach and communications program to inform and involve the public. To that end, the Authority holds community meetings in cities and counties along the 119-mile alignment where construction is underway. This includes regularly issuing project updates through a variety of means and hosting construction tours for a wide range of stakeholders to showcase completed and ongoing construction. The range of stakeholders the Authority works with in the Central Valley is highlighted in [Exhibit 4.2](#).

Exhibit 4.2: Central Valley Stakeholders



In February 2021, Governor Gavin Newsom toured the construction work happening at the San Joaquin River and Cedar viaducts in Fresno County. Other dignitaries to visit construction sites included United States Senator Alex Padilla, Representative Jim Costa and Administrator of the Federal Railroad Administration Amit Bose, as well as members of the Legislature and their staff, the Legislative Analyst's Office, and local and regional elected officials.

Throughout the year, the Authority also welcomes students from various colleges across the state to tour high-speed rail construction as part of the Authority's "I Will Ride" student outreach initiative.

Engineering students from Fresno City College and Fresno State University have visited construction sites in the city of Fresno and have learned about the project first-hand from project engineers. Students have also networked with high-speed rail professionals on a variety of topics including ongoing construction, engineering, communications and environmental sustainability, as the Authority works to emphasize job opportunity for minorities and women in Science, Technology, Engineering and Math (STEM).

Chinatown Mural Highlights Cultural Past, Future of High-Speed Rail System

The Authority, in partnership with the Fresno Arts Council, Chinatown Fresno Foundation and the City of Fresno, helped sponsor a new mural in Fresno's Chinatown along China Alley. The mural, spearheaded by local artist Mauro Carrera with the assistance of artists Sara Sandoval and Rigoberto Garcia, represents and pays homage to the rich and historic past of Fresno's Chinatown, while looking toward the future of building the nation's first high-speed rail system. The mural is located on China Alley and Tulare Street, next to a high-speed rail underpass currently under construction and steps from the future Fresno Station. "Cultural arts projects like this mural are great ways to bring the community together," said Authority Chairman Tom Richards. "We hope this piece contributes to the ongoing revitalization of downtown Fresno and Chinatown and sparks a conversation about what the future high-speed rail system has to offer to Fresno and all Californians."

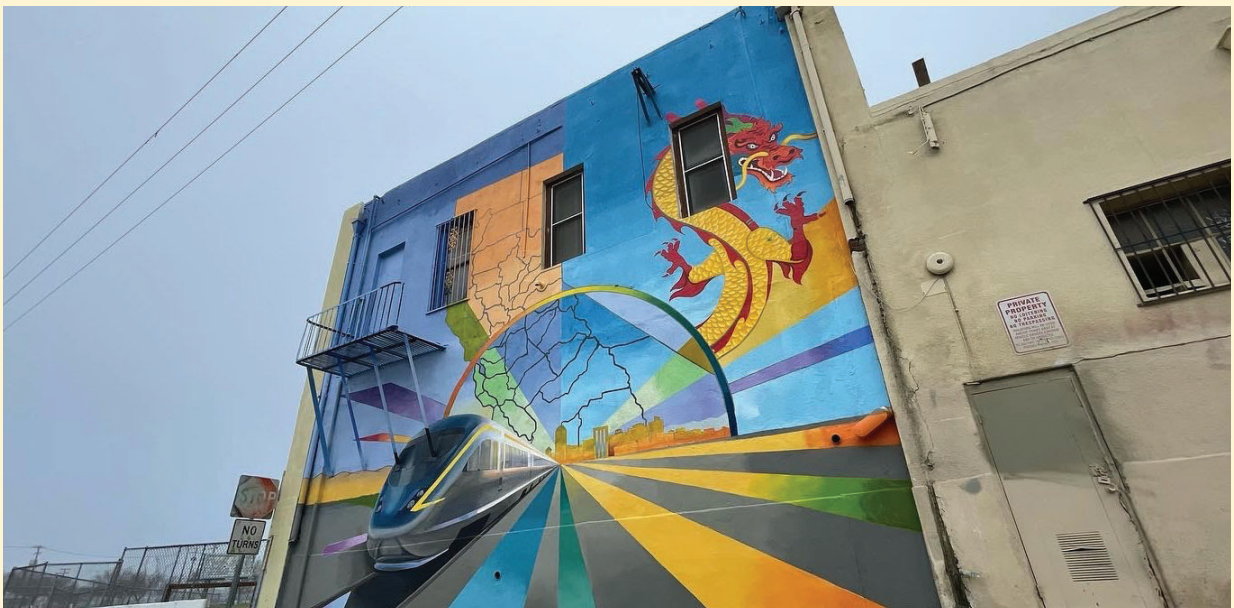
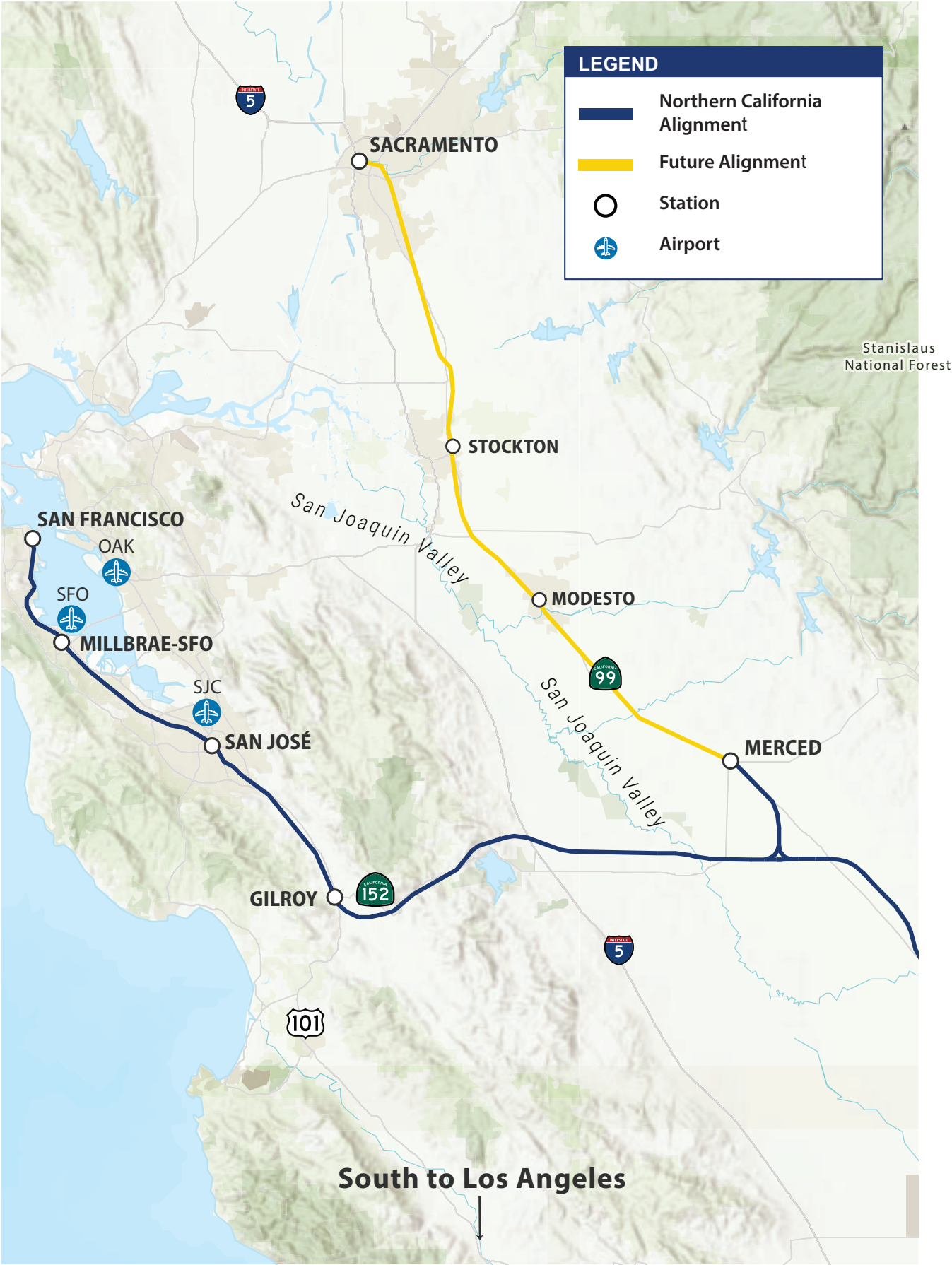


Exhibit 4.3: Northern California Regional Map





Rendering: Bayshore Caltrain Station

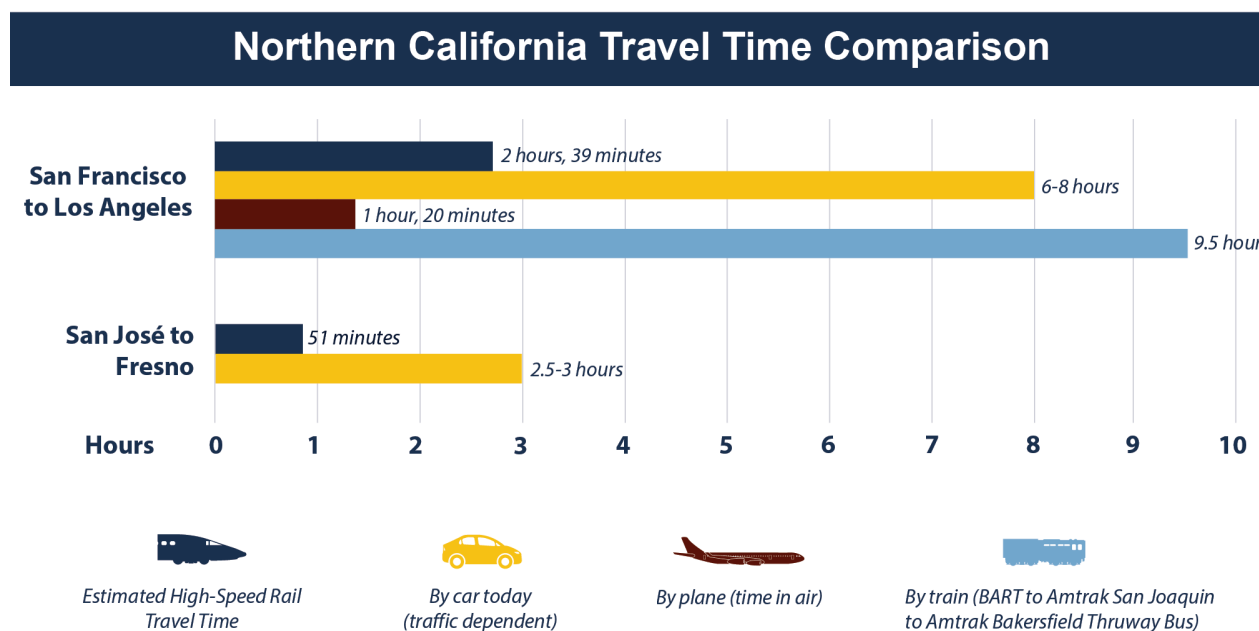
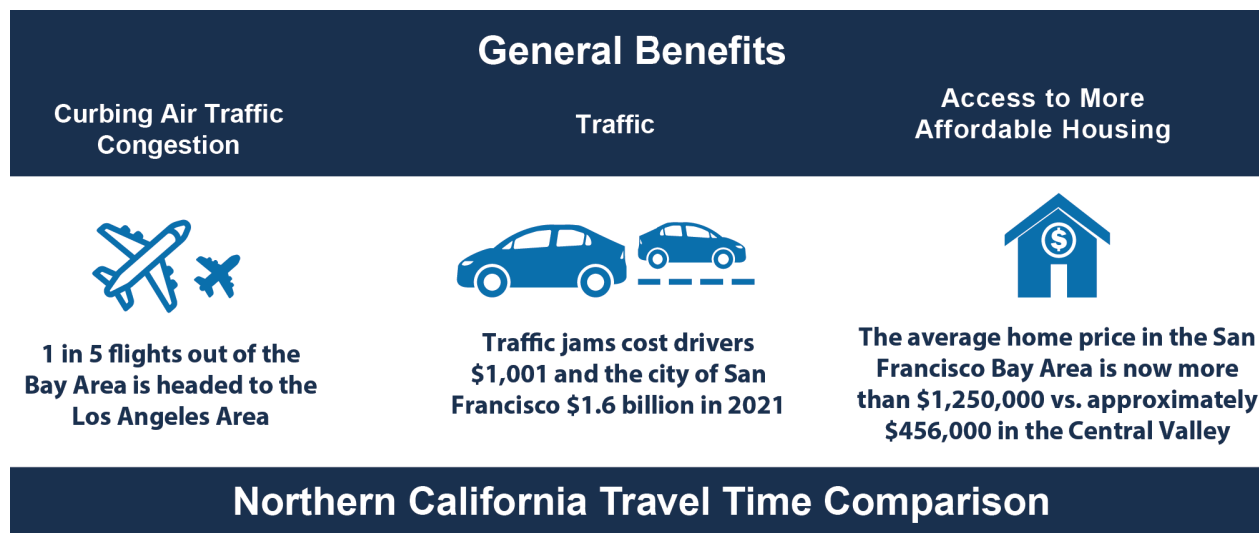
NORTHERN CALIFORNIA UPDATE

Completing the portions of the high-speed rail system in Northern California, as shown in [Exhibit 4.3](#), and Southern California and connecting them to the 119 miles already under construction in the Central Valley will be a game changer for the entire state. High-speed rail will dramatically reduce travel times between the Bay Area and Southern California megaregions and the Central Valley (e.g., a trip from San José to Fresno will be around one hour), allowing for more connections, more economic opportunities and more options for both companies and people to live and work, as shown in [Exhibit 4.4](#) on page 76.

Since the 2022 Business Plan, the Authority has made significant progress toward connecting the Northern California region to the statewide system with the finalization of the environmental clearance work in the region. In 2022, the Authority Board of Directors approved the environmental documents and alignments for both the San Francisco to San José and San José to Merced project sections, the culmination of nearly a decade of stakeholder and community engagement as well as environmental analysis. The next step will be to obtain funding to advance design work in the region to prepare for construction as soon as possible.

The Caltrain Electrification Project, a critical building block in delivering a modernized commuter and intercity passenger rail corridor and future high-speed rail service, for which the state is a major funding partner, is advancing. In August 2022, one of the two major power substations for the Caltrain electrification project was energized for the first time, a milestone that will allow testing of equipment at Caltrain's San José facility and on a portion of the San José to San Francisco corridor. The Authority contributed \$714 million toward Caltrain Electrification and looks forward to celebrating its completion, which is anticipated in 2024. This builds on the grand opening of the 25th Avenue Grade Separation Project in San Mateo, which was completed in September 2021, and to which the Authority contributed \$84 million to help improve the connectivity between the two sides of the rail corridor.

Additional joint-benefit projects and multi-agency partnerships that the Authority is engaged with in Northern California include The Portal (formerly known as the Downtown Extension Project), which will connect the existing rail corridor to Salesforce Transit Center, and the Diridon Integrated Station Concept Plan, which will reimagine Diridon Station as a major intermodal hub.


EXHIBIT 4.4: General Benefits of High-Speed Rail in Northern California Region

*All travel times are approximate. Trips are measured from central business district, existing passenger rail stations, or planned high-speed rail stations. Existing passenger rail travel times were approximated using the Amtrak website, referencing schedules current as of publication. Car travel times were estimated based on mid-week, peak-hour trip. High-speed rail travel times are for non-stop service.

Project Jobs/Economic Impact and GHG Savings



Approximately **200,000** projected job-years through construction completion and about **\$44 billion** in economic activity



Zero emissions trains will reduce GHG emissions (CO₂e) by up to 519,000 - 621,000 metric tons per year by 2040, which is equivalent to removing emissions from roughly **134,000** gas-powered passenger vehicles driven for one year.



Photo: Hanford Viaduct Concrete Placement

Milestones Achieved

The Authority and its partners have achieved numerous milestones in Northern California that will be essential to creating a high-speed-rail system that connects the region to the rest of the state. A summary of recent milestones in Northern California is presented in [Exhibit 4.5](#) on the following page.

Environmental Clearance

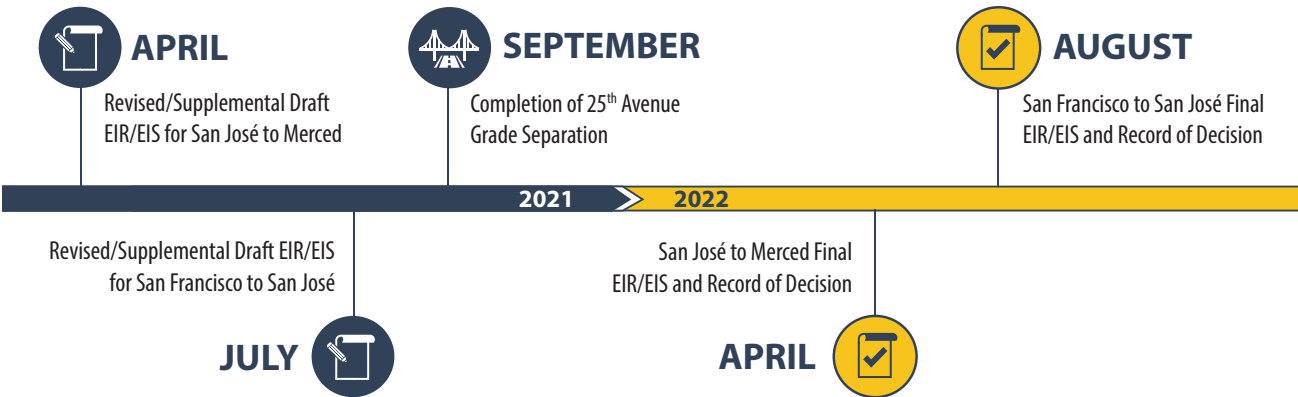
In April 2022, the Authority Board approved the Final Environmental Impact Review/Environmental Impact Statement (EIR/EIS) for the San José to Merced project section, selecting a preferred alignment that will modernize and electrify the existing rail corridor between San José and Gilroy, allowing for both electrified high-speed rail and Caltrain service. This was followed in August 2022 with the approval of the San Francisco to San José project section's Final EIR/EIS, selecting a preferred alignment that builds on the Caltrain electrification project and incorporates the infrastructure necessary to run high-speed rail service in the corridor. The completion of these documents and environmentally clearing the sections represents years of outreach and community input that allows the Authority to move forward with advanced design work as funding becomes available. The Authority is facing three CEQA law-

suits stemming from the San Francisco to San José environmental documents, one from the City of Millbrae, one from the City of Brisbane and one from a developer in Brisbane. The Authority is working with plaintiffs to stay the litigation matters so it can work with them to address their concerns around the Light Maintenance Facility and Millbrae-SFO station.

"Simply put, high-speed rail will change travel in the state of California. Once high-speed rail is fully operating, it will be the equivalent of taking 400,000 passenger vehicles off our roads every year and getting high-speed rail to San Francisco is important for our city and the people who live here."

– San Francisco Mayor
London Breed

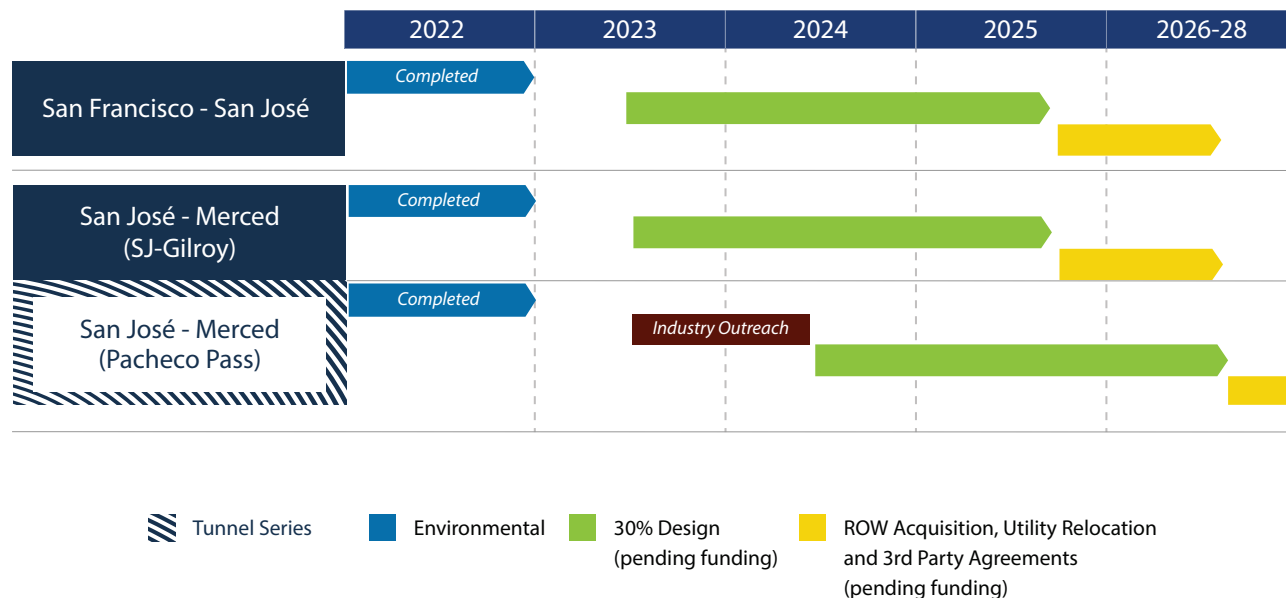
Exhibit 4.5: Northern California Timeline: 2021-2022



Milestones to Follow

With environmental clearance complete, the Authority’s focus in Northern California will be moving toward advancing system implementation in the region. Our first priority will be to advance the design to complete a configured footprint that can serve as the basis for the acquisition of right-of-way and other pre-construction activities and the eventual procurement of construction contracts. This will include a variety of efforts along the corridor, including design refinement, geotechnical investigations in Pacheco Pass, agreements with third parties such as railroad owners/hosts (Caltrain and Union Pacific Railroad) and others. Finally, in areas where development pressures or other circumstances necessitate, the Authority will explore strategic right-of-way acquisitions to preserve the corridor. **Exhibit 4.6** shows the potential timeline for advancing design if funding were available.

To begin this work, the Authority intends to submit a Federal-State Intercity Rail Partnership grant application for the next phase of design development starting with the San José to Merced project section along with the Bakersfield to Palmdale project section in Southern California. Although the Authority’s priority is for the funding necessary to complete the Central Valley Merced to Bakersfield service, this application is an important step in advancing design on the Silicon Valley to Central Valley Line bringing high-speed rail to the Bay Area and the connection from the Central Valley to Los Angeles County.

Exhibit 4.6: Potential Northern California Design Timeline

The Authority continues to work closely with regional partners to bring high-speed rail to Northern California and to work collaboratively to deliver regionally led projects that will prepare the Bay Area for high-speed rail service. The range of stakeholders the Authority works with in Northern California is highlighted in [Exhibit 4.7](#).

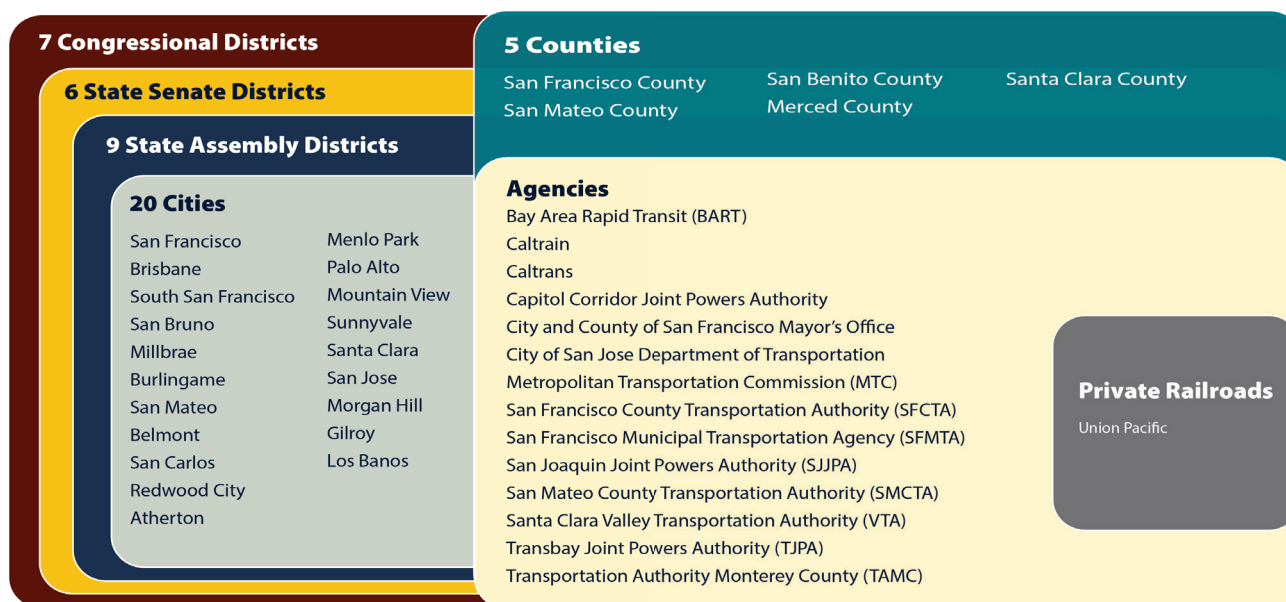
EXHIBIT 4.7: Northern California Stakeholders

Exhibit 4.8: Southern California Regional Map



SOUTHERN CALIFORNIA UPDATE

The Southern California megaregion is home to the southern terminus of the 500-mile system from San Francisco to Los Angeles/Anaheim. It is the future home to 164 miles of high-speed rail extending from Bakersfield through the Los Angeles Basin, as shown in [Exhibit 4.8](#). Activities are underway that will provide improved transportation choices for the more than 23 million people who call Southern California home, as shown in [Exhibit 4.9](#) on page 82.

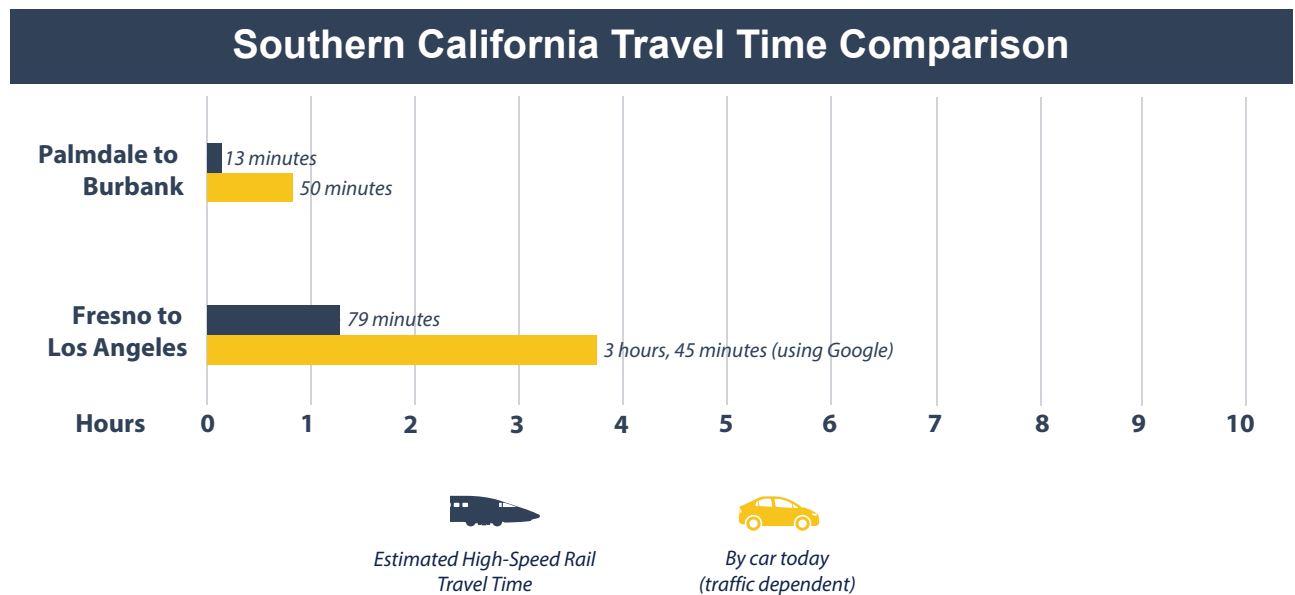
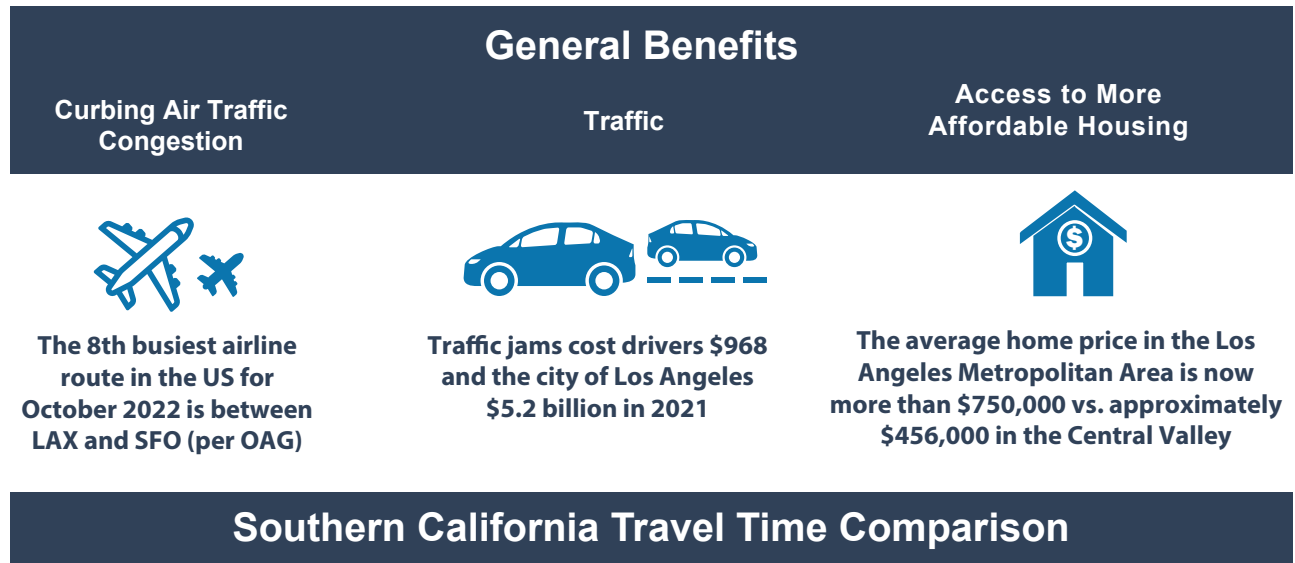
Over the last two years, the Authority has environmentally cleared two project section alignments in Southern California – Bakersfield to Palmdale and Burbank to Los Angeles – and the draft environmental document for the third of four environmental sections in this region, from Palmdale to Burbank, was issued in September 2022.

The Authority continues to partner with the Los Angeles Metropolitan Transportation Authority (Metro) on upgrades to Los Angeles Union Station, to which the Authority committed \$423 million. In addition, the Rosecrans/Marquardt Grade Separation Project received \$77 million and broke ground in 2022.

The Authority continues to work with local partners to develop station area plans around proposed high-speed rail stations that will provide access to regional transportation on Metro, Metrolink and Amtrak trains.



Rendering: High-speed train in the San Fernando Valley


EXHIBIT 4.9: Southern California General Benefits

*All travel times are approximate. Trips are measured from central business district, existing passenger rail stations, or planned high-speed rail stations. Existing passenger rail travel times were approximated using the Amtrak website, referencing schedules current as of publication. Car travel times were estimated based on mid-week, peak-hour trip. High-speed rail travel times are for non-stop service.

Project Jobs/Economic Impact and GHG Savings



Approximately **320,000** projected job-years through construction completion and about **\$73 billion** in economic activity



Zero emissions trains will reduce GHG emissions (CO₂e) by up to 483,000 - 587,000 metric tons per year by 2040, which is equivalent to removing emissions from roughly **125,000** gas-powered passenger vehicles driven for one year.

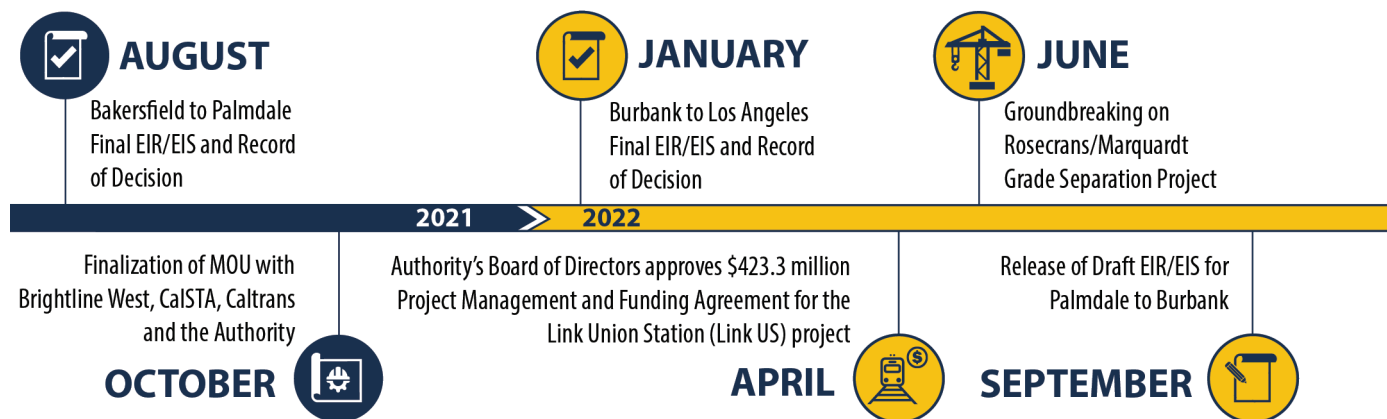
The Authority is ensuring that the high-speed rail station at the existing Los Angeles Union Station (LAUS) will be part of a comprehensive transit network, providing seamless connections throughout the Los Angeles region. The Authority is partnering with Metro on the Link Union Station (Link US) Project to complete environmental reviews and advance Phase A of the project, which will create run-through tracks over the US-101 freeway, increasing capacity and saving time, as well as ready the station for high-speed rail service. Since the 2022 Business Plan, the Link US project has elected to cancel the procurement of a Construction Manager/General Contractor. The procurement will restart in the third quarter with the goal of awarding a contract before the end of 2023. The Authority continues its role in NEPA assignment and will also continue participating in biweekly meetings as the revised project description evolves in support of environmental clearance.

In April 2022, the Authority's Board of Directors approved the Project Management and Funding Agreement for the Link US Phase A project. Forecasted to open in 2028, this project will transform LAUS into a modern transit hub ready to host fans for the 2028 Summer Olympics.

“We thank the California High-Speed Rail Authority Board of Directors for their approval of this important funding agreement for Metro’s Link Union Station Phase A project. This is a key funding milestone for the Link Union Station project, which will improve the customer experience for transit users, promote economic development and prepare this important node in our transportation network for high-speed rail.”

– Metro Chief Executive Officer
Stephanie N. Wiggins

The Rosecrans/Marquardt Grade Separation Project officially broke ground in June 2022. This project, located within the Los Angeles to Anaheim project section, improves the safety of what the California Public Utilities Commission calls one of the most hazardous rail crossings in the state. From 2013 to 2019, there were 31 accidents involving vehicles and trains; 45,000 cars and 135 trains cross through this intersection on average each day. The Authority is a partner in this \$156 million dollar grade separation that will improve congestion, air quality and safety.

Exhibit 4.10: Southern California Timeline**Milestones Achieved**

We have achieved several major accomplishments in the last two years. In addition to completing environmental clearance for two high-speed rail project sections in Southern California and releasing a draft EIR/EIS on a third section, the Authority continues work with regional partners to advance bookend projects in the region. A summary of recent milestones in Southern California is presented in [Exhibit 4.10](#).

Environmental Clearance

As of the end of January 2022, the Authority Board had approved a Record of Decision on two Southern California project section Final EIR/EISs – Bakersfield to Palmdale and Burbank to Los Angeles – setting the stage for pre-construction activities to begin.

Milestones to Follow

In September 2022, the Authority released the draft EIR/EIS for the Palmdale to Burbank project section. It will connect key population centers in Los Angeles County, the Antelope Valley and the San Fernando Valley, by linking future multimodal transportation hubs in Palmdale and Burbank. The draft environmental document evaluates the impacts and benefits of six build alternatives along the 31-to-38-mile section. The preferred alternative would avoid crossing Una Lake and minimizes im-

pacts to nearby wetlands. The final EIR/EIS is anticipated to be released in Fall 2023, completing all environmental documentation from San Francisco to Los Angeles. Work will continue on the last environmental document from Los Angeles to Anaheim through 2025.

The Authority also intends to submit a Federal-State Intercity Rail Partnership grant application for the next phase of design development for the Bakersfield to Palmdale project section to continue with design efforts extending the Merced to Bakersfield early operating segment. This application is an important step in advancing design towards bringing high-speed rail to Los Angeles County.

The Authority will continue to coordinate with stakeholders and pursue funding for the Bakersfield to Palmdale and Burbank to Los Angeles project sections, both of which have been environmentally cleared and are ready for the next stage of project development. This continued engagement with local planning efforts will help ensure project compatibility in areas that will be affected by the high-speed rail alignment. [Exhibit 4.11](#) shows the potential timeline for advancing design once funding is available.

This work will require the Authority to continue coordination with key stakeholders throughout the region highlighted in [Exhibit 4.12](#).

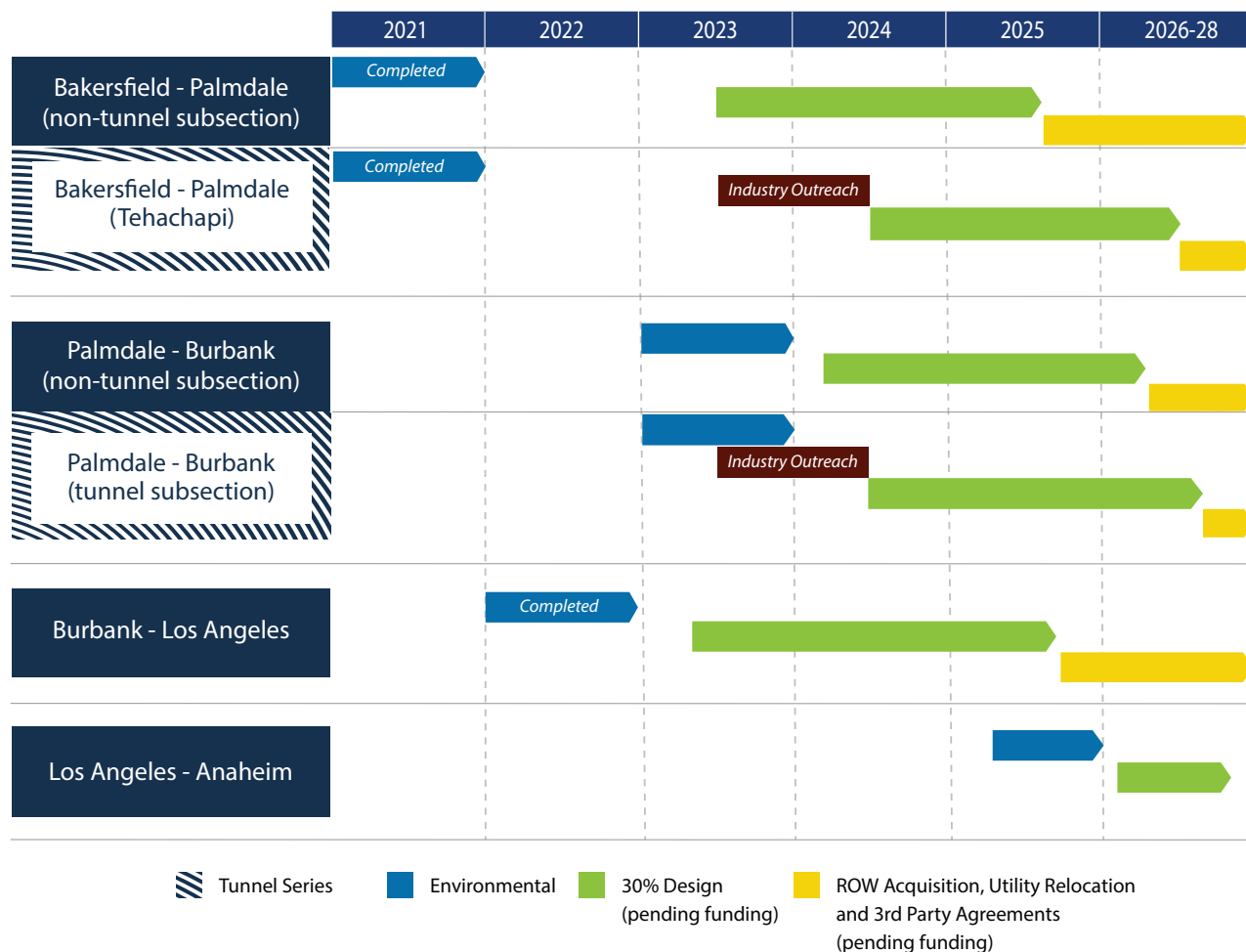
Exhibit 4.11: Potential Southern California Design Timeline**EXHIBIT 4.12:** Southern California Stakeholders



Photo: Fowler Road (foreground) and Elkhorn Grade Separations



Photo: Ashlan Avenue Viaduct

Chapter 5: *Management of Key Issues*

INTRODUCTION

Large transportation projects are complex. Like other mega-transportation projects, the California high-speed rail project faces a series of complex issues and risks. This chapter expands upon some of the challenges discussed in previous reporting, such as the 2022 Business Plan and the State Leadership

Accountability Act. The updates are intended to provide additional context and insight into the key issues that the Authority faces today.

In addition to using this chapter to provide a description of these key issues, we also provide information on the actions and progress that the Authority has made on addressing the reported issues.

CURRENT ENVIRONMENTAL LITIGATION

A program of this nature will experience a variety of legal risks. These include potential litigation and adjudicatory administrative processes related to project funding, environmental clearances, property acquisition and contract disputes. Previous litigation has already resulted in impacts to the Central Valley Segment construction costs and schedules. The Authority continues to learn from, and subsequently anticipate and manage litigation and settlements that impact the program scope, schedule, and costs. Our current active litigation is focused on California Environmental Quality Act (CEQA) challenges, and the section below outlines current actions taken to mitigate environmental litigation at the Authority.

Action Taken:

- For the Authority's two environmental documents in the Central Valley (Merced to Fresno and Fresno to Bakersfield), the Authority received close to a dozen CEQA lawsuits. These were resolved without the need to pursue litigation to completion.
- As to the lawsuit brought by the Burbank-Glendale-Pasadena Airport Authority (BGPAA), the Authority is confident that the Burbank to Los Angeles environmental document meets and exceeds the legal standards and that it will prevail in CEQA litigation. That said, because any future design of the Burbank to Los Angeles alignment, as it relates to the BGPAA, will require extensive coordination with the BGPAA and certain, explicit approvals from the BGPAA and the Federal Aviation Administration. The Authority is working closely with the BGPAA.
- As to the lawsuit filed by the City of Brisbane, the Authority is confident that the San Francisco to San José environmental document meets and exceeds the legal standards and that it will prevail in this litigation. The Authority has worked consistently with the City of Brisbane from the inception of the environmental document to its completion to address concerns that are appropriately resolved in the early environmental review stages of a project and considers the City of Brisbane to be a critical partner for the project.
- As to the lawsuit filed by the City of Millbrae, the Authority is confident that the San Francisco to San José environmental document meets and exceeds the legal standards and that it will prevail in this litigation. That said, the Authority believes the City of Millbrae is an important partner to the project and we will continue discussions with the City to address how the parties may partner on the project as we advance to design and construction.
- As to the lawsuit filed by Baylands Development, Inc., the Authority is confident that the San Francisco to San José environmental document meets and exceeds the legal standards, and we expect to prevail in this litigation.
- For all four of these lawsuits, without current funding for these segments, the litigation can work its way through the process without delaying construction by the Authority.
- As the program advances, the Authority will continue to work closely with affected stakeholders to address issues that can be resolved during the environmental process and, if litigation is filed, endeavor to work with the parties to efficiently settle concerns amicably.

ORGANIZATIONAL CHALLENGES

The Authority continues to evolve organizationally to achieve the program's strategic goals and objectives. A key component of its organizational strategy is manifested by evaluating and prioritizing critical gaps and vacancies to ensure continuity of critical functions throughout the Program. The following risks and mitigation plans constitute the Authority's approach to sustaining is operational excellence.

Staffing Gaps

Two of the top statewide reported risks between 2017 to 2021 (for State Leadership Accountability Act reporting) are Key Person Dependence/Workforce Planning and Recruitment/Retention.

Action Taken:

- The Authority continually plans and assesses workload and staffing needs, including reviews of roles and responsibilities, to inform budget change proposals (BCPs). This includes continuing the Form to Function efforts (assessments, re-organization and BCP training) to streamline the addition of new state staff positions and transition new consultant staff, where appropriate.
- The Authority is managing the increased workload associated with the large volumes of new positions by streamlining processes for hiring managers. This includes work prioritization / alignment with senior leadership which ultimately seeks to get recruitments completed faster.
- The Authority continues workforce diversity, equity and inclusion task force (committee) outreach efforts to help diversify our candidate pool.
- The Authority established and filled a state position to develop and implement the Workforce and Succession Plan, Steering Committee, gap assessments and data collection metrics for the Authority (e.g., collection of issues and challenges with regard to recruitment, retention, knowledge transfer and succession planning within the Authority to determine where resources and actions must be focused).
- The Rail Delivery Partner (RDP) contract is transitioning to the new contracts for Program Delivery Support (PDS), Planning and Sustainability and Rail System Engineering Services. These contracts provide specialized consultant program and technical support services. The Authority has identified three transition phases of current RDP services to the new contracts:
 - Short-term transition (first three months) for functions that have well documented procedures and processes such as Engineering Services and Program Management Oversight;
 - Medium-term transition (three to six months) to allow the RDP to complete specific deliverables to maintain momentum – such as environmental documents or right of way parcels during transition to PDS staff; and
 - Long-term transition (up to 12 months) for unique items not transitioning to PDS (such as claims support for cases in arbitration), Planning and Sustainability and Rail Systems Engineering while the Authority procures other support and/or another technical services vendor.

CONSTRUCTION

While the Authority has established a Staged Project Delivery Process and Configuration Management Plan to enhance consistency and efficiency in its design, environmental clearance, and construction activities, the Authority continues to actively manage gaps in construction quality, securing of passenger rail rights with its contractors, and third-party relationships.

Quality Control and Assurance

The quality and control program is working to capture critical gaps which may result in construction quality issues, as well as safety and reputational impacts.

Action Taken:

- A Quality Policy, a Quality Plan, and Quality Processes and Procedures define the Authority's commitment to quality and directs and guides program quality efforts.
- The Authority has achieved International Organization for Standardization (ISO) 9001:2015 Certification, as well as the ISO 45001:2018 certification for Safety and Security.
- The Authority model creates a strong control framework for capturing construction quality issues in the field and maintains a centralized quality group for enterprise-level review, validation and oversight of the quality control functions in the field, including:
 1. Design Builders (DBs);
 2. Project Construction Management (PCM) firms;
 3. A centralized program-level Quality Group; and
 4. Independent peer reviews.
- The Authority's Infrastructure Delivery and Quality Oversight Team work together to implement quality control policies, procedures, and certifications to maintain field and office quality control and assurance for construction projects.
- Audits, Assessments and Non-Conformance Report systems are leveraged to help capture, document and report known issues, to address risks before materializing into issues, and to analyze and develop reporting metrics and Key Performance Indicators.

Track and Passenger Rail Rights

If the Authority cannot obtain shared passenger rail rights and the ability to construct in existing rail corridors owned by others, the Authority cannot operate trains.

Action taken:

- Authority staff in Southern California continue to improve communication with other relevant parties (e.g., legal) to research who owns which aspect of the risk.
- Continue to conduct ongoing negotiations with railroads/transit authorities on connecting to existing rail corridors.
- The Authority developed existing agreements with Caltrain that lay the foundation for more specific agreements.
- Research ownership and negotiate purchase of passenger rail rights as required for each section.

MITIGATING ISSUES AND RISKS

The issues listed above are not intended to be a comprehensive list of all issues but note some of the key issues and other risks that are being captured and monitored at the enterprise, project- and program-level. The project level represents the lowest level of risk register granularity, while the enterprise level register constitutes the highest level of risk management at the Authority. These registers track key information such as risk owners, the risk description and context, formal assessment and prioritization, and mitigation plans with the end goal of informing key decisions and prioritizing management actions.

The Authority has finalized criteria that indicates when risks should be escalated or de-escalated, as needed. This helps ensure that risks (i.e., opportunities and threats) are monitored at the appropriate level and driving the appropriate level of action within the Authority.

In addition, the Authority is developing a program level risk register. This intermediate level of risk identification and monitoring is between project-level and enterprise-level risk management. As can be seen in **Exhibit 5.0**, there are four program areas that can be elevated to an Enterprise level as part of a comprehensive escalation process from the Project level. These include:

1. Advanced planning;
2. Environmental clearance and configuration;
3. Construction; and
4. Rail operations.

As noted, the program risk register will be a key pillar and intermediary between risks being monitored at the project and enterprise levels. Similar to project-level risk registers, the key program-level risks will be reviewed monthly. This level of review will also enable visibility into key risks as well as identify integration risks across projects.

In summary, the Authority has designed a holistic enterprise risk management program that is supported by a hierarchy of risk registers between the project, program and enterprise levels. The program

aims to facilitate the identification and prioritization management of risks with the appropriate level of governance and oversight. Additional detail on the governance and management of risks within the Enterprise Risk Management program is included in Chapter 6, Building Confidence Through Risk Management.

Exhibit 5.0: The Authority's Risk Register Hierarchy and Integration

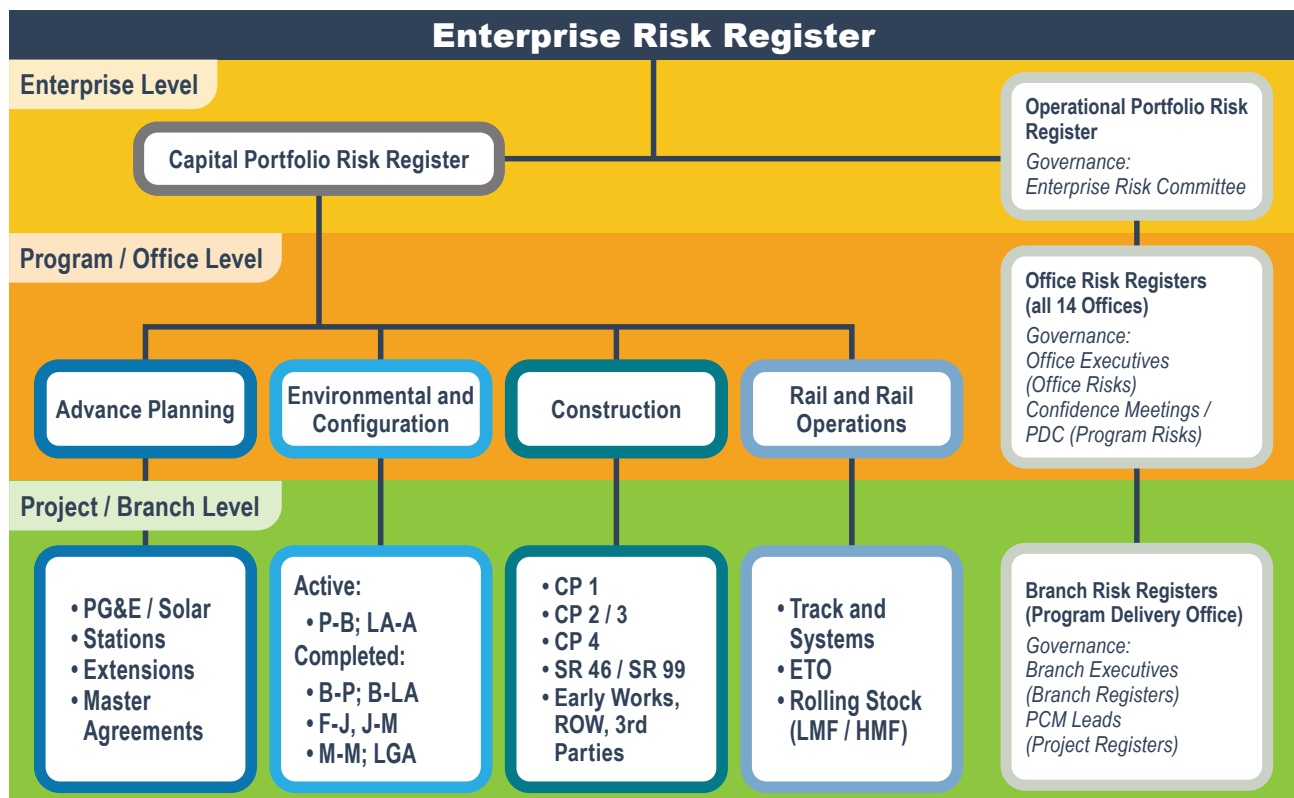




Photo: Girders placed at the Hanford Viaduct



Photo: Cedar Viaduct

Chapter 6: *Building Confidence Through Risk Management*

INTRODUCTION

The Authority faces a variety of internal and external risks (opportunities and threats), which have the potential to affect the success of our stated goals and objectives. The Risk Management Office (RMO) was established to increase risk awareness and management capabilities through an established risk management function to ultimately improve decision making. This effort included the formal development of an Enterprise Risk Management (ERM) program and establishing the Enterprise Risk Committee.

The Authority developed seven key risk management process areas (**Exhibit 6.0**), carried out across the entire organization, which enable cross-functional collaboration to achieve operational excellence in reducing threats and enhancing opportunities.

This seven-step framework also incorporates key principles of the Government Accountability Office's Greenbook and Committee of Sponsoring Organizations of the Treadway Commission's (COSO's) Enterprise Risk Management – Integrating with Strategy and Performance framework.

Exhibit 6.0: The Authority’s Enterprise Risk Management Process Framework

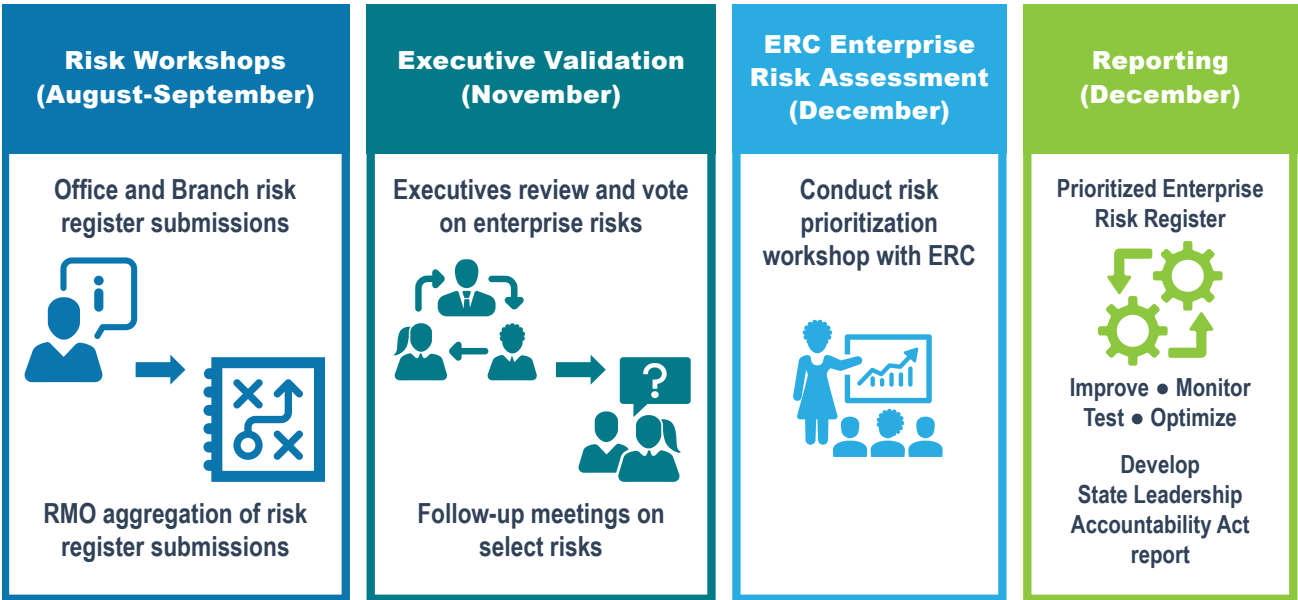


ENTERPRISE RISK MANAGEMENT

With the creation of an Enterprise Risk Management program, the Authority established a baseline Enterprise Risk Register (**Exhibit 6.1**) in coordination with the Authority’s offices and branches.

The result of these efforts included more than 100 risk submissions, new lines of risk communication channels opened, discussions in various workshops and an ultimately approved Enterprise Risk Register containing the top strategic risks to be managed and monitored by the Authority’s Enterprise Risk Committee (ERC).

Exhibit 6.1: Approach to Establish the Authority’s Annual Enterprise Risk Register



AUTHORITY RISK ASSESSMENT METHODOLOGY

The Authority recognizes that not all risks are the same; similarly, the treatment of risks should reflect the differences in the magnitude and level of controls or mitigations already in place for such risks. The following key principles reflect the Authority's risk assessment methodology:

1. Risks are not all limited to downside risk exposure: The risk assessment methodology is designed to facilitate the identification of threats and opportunities.
2. Risks are tied to the Authority's objectives: A guiding focus of risk identification during the risk assessment is on the Authority's strategic objectives.
3. Use of standardized risk rating criteria: The assessment of risk includes the magnitude and/or severity of the impact, likelihood or probability of occurrence, and management preparedness.
4. Risk assessment results across the enterprise are aggregated and prioritized using a Risk Action Matrix, which elicits a specific risk action/response strategy within one of four areas:

- ▶ Improve: These high-exposure, low-control risks are actively managed by leadership to improve mitigations.
- ▶ Monitor: These low-exposure, low-control risks are kept on the radar and monitored on a frequent basis.
- ▶ Test: These high-exposure, high-control risks are well managed, but are still reviewed to ensure that mitigations and controls are functioning as intended.
- ▶ Optimize: These low-exposure, moderate- to high-control risks are well managed given the level of exposure relative to the level of controls around these risks.

On an annual basis, the Risk Management Office conducts an enterprise risk assessment to identify any new risks for the Enterprise Risk Committee to discuss for inclusion in the Enterprise Risk Register. There is also a monthly forum for committee members to analyze and potentially include emerging risks throughout the year. For instance, with the emergence of increased inflation, a risk was presented, approved and included on the Enterprise Risk Register during 2022.

KEY RISK AREAS

The sections below describe the Enterprise Risk Register top strategic risks, and the associated mitigation strategies to address those risks. Please note that this is not an exhaustive list. Detailed project and program delivery risks are also captured, evaluated and managed as the program advances.

Funding Uncertainty

The California high-speed rail project has never had the full funding needed to complete the entirety of the voter approved San Francisco to Los Angeles/ Anaheim project. Without an ongoing revenue source and support from the federal government, project risks associated with funding will continue. As the Authority applies for and receives new federal funds, it can continue to expand construction and reduce future risks associated with project completion. With new funding, the Authority can continue to expand construction minimizing project completion delays.

Key Mitigation Strategies to Address Funding Risks:

- Ensure on-time submission of appropriate budget documents to the Department of Finance and the California Legislature.
- Ensure submission of quality applications for new competitive federal funding opportunities to support the project.
- The CEO and Regional Directors communicate openly with state and federal legislators and their staff to keep them informed on the high-speed rail project's progress and funding status.
- Actively monitor projected expenditures and available cash to mitigate any potential short-term funding issues.
- Ensure Board support for the Authority's federal grant strategy by keeping the Board updated on grant strategy and applications. As needed, seek Board action to update the Program Baseline Budget.
- Prioritize budget expenditures, as needed, to address any delays in receiving a Proposition 1A appropriation from the Legislature. Note: this has been completed as part of the 2022 budget.

Inflation

Current prices of goods and services have experienced above-average inflation influenced by pandemic-stricken supply chains, conflict in Eastern Europe and sanctions on China and Russia. These circumstances have contributed to reduced purchasing power / increased costs and schedule program delivery delays. If the prices of goods and services increase more than planned due to market and other external factors, then there could be impacts to the cost and schedule of the Program Baseline, affecting the Authority's ability to achieve its goals and objectives.

Key Mitigation Strategies to Address Inflation Risks:

The Authority has taken the necessary steps to include allowances in its cost estimates for future work, including updates for the current inflationary environment on future work packages and current contracts. Several methodologies are used to help capture the impact of inflation (such as the right of way Case-Schiller Index) to help estimate future project costs. For forecasting, the Authority leverages data from the California Department of Finance and United States Federal Reserve. On a monthly basis, inflation impacts are reviewed across specific commodities based

on Engineering News-Record and Federal Reserve Economic Data to monitor changes to inflation throughout the scope of the project. The Authority is also developing a strategy for managing current and future volatility in inflation such as:

- Include escalation indices in contracts, such as the Track and Systems procurement, to promptly address volatility in prices as cost volatility does not go away – the benefit of including escalation indices in a contract is to have an established mechanism to deal with price volatility in a structured and agreed-to manner. Ultimately, this leads to contractors lowering the risk allowance in their bid cost.
- Integrate planning and implementation of the Staged Project Delivery Process to ensure that the sequence of activities, such as right-of-way acquisition, advanced design, environmental/utility agreements and construction, align to avoid project delay impacts of inflation. Within this framework, this process allows for seeking alternative delivery to accelerate project delivery timeline to reduce impacts of inflation.
- Evaluate contract requirements (i.e., mega-agreements), where warranted, to understand if our current supply base/market can cope with the needs of the Authority (e.g., steel for construction).

Track and Systems and Other Major Procurements

The delivery of this complex mega infrastructure program requires the Authority to effectively plan and execute procurement and contracting strategies. This includes, but is not limited to, the need to procure track and systems, acquire trainsets, and complete other elements related to successful construction and rail operations. The Authority is reviewing the procurement strategy for high-speed rail trains and evaluating the schedule risks and considering impacts to the overall program.

The transition from civil infrastructure construction to track and systems installation requires close coordination to avoid negative impacts to program delivery. The section below outlines current strategies to mitigate risks related to the upcoming track and systems procurement(s). If changes occur in project definition prior to awarding the track and systems contract, the Authority may face unplanned costs and adverse consequences.

Key Mitigation Strategies to Address Procurement Risks:

- A Track and Systems and Train procurement approach is under consideration and discussion, with a procurement to be released in 2023. This new procurement will consider the lead time for material supplies given lingering supply chain issues.
- Staff continue to advise and provide updated strategies for scope decisions to executive leadership.
- Cross-functional collaboration to evaluate and resolve the following risks associated with Track and Systems implementation:
 1. Track and Systems procurement delays (cost goes up the longer it is delayed);
 2. Civil Design-Builder to Track and Systems interface and handoff; and
 3. Train procurement coordination with Track and Systems.

Third Party Schedule Management

To ensure the timely completion of projects, the Authority is actively working to identify mitigation strategies for risks which could change schedules. This section outlines current strategies to known and unknown risks associated with schedule.

For example, risks associated with potential delays due to third parties (e.g., utility owners, local agencies, etc.) pose substantial schedule risk. Changes in scope to accommodate third-party requirements and budget can add significant delay to project construction. As mitigation, the Authority established a strike force team to handle certain issues that rise to the executive level. These efforts help to pre-determine areas where potential utility conflicts could occur, and interdisciplinary reviews are conducted to be more proactive in addressing issues in advance.

Key Mitigation Strategies to Address Third Party Risks:

- **Railroad Companies:** The Authority has overarching agreements in place with the railroads and is working to get additional agreements in place. Certain requirements, such as black-out periods or Form B needs, are issues that the Authority must continually manage with its active construction projects in the Central Valley. The Authority is strengthening relationships and improving lines of communication across all levels with railroad partners. The Authority monitors its schedule progress monthly to seek avoidance of issues that could delay construction activities.
- **Local Agencies:** The Authority does not have all local agency agreements in place for the Central Valley. However, we identified the needed agreements and are working to get all necessary agreements in place. We also continue to maintain relationships and open lines of communication to facilitate smooth permitting processes. This includes resolving issues with local governments and meeting regularly with local agencies to resolve concerns. To avoid slowdowns in the permitting process, the team is prioritizing necessary permitting agreement review prior to construction to get ahead of deadlines. The Authority continues to look for opportunities to partner with local agencies to have them perform work on ancillary facilities within their jurisdiction that are not required for high-speed rail system operations.

- **Environmental Agencies:** California's Central Valley is home to several rare, threatened and endangered species that pose challenges for construction while protecting the state's natural biodiversity. The Authority's environmental management meets weekly with California Department of Fish and Wildlife (CDFW) Region 4 management to discuss critical issues relating to construction progress and areas for improvement. The Authority also meets weekly and monthly with CDFW staff to discuss construction status and progress related to permit compliance for covered species (such as the California tiger salamander, Tipton kangaroo rat and San Joaquin kit fox), other wildlife and jurisdictional water features.

- **Utilities, PG&E, Irrigation Districts:** To advance construction and satisfy third-party agreements, various updates and changes to agreements can occur, which lead to extended timelines that impact construction. To mitigate this, we are opening lines of communication, being clear and transparent where possible, and building trust. In addition, due to resource constraints on the third-party side, there are sometimes additional limitations in place that are strictly personnel related due to the lack of dedicated resources on the third-party side compared to staffing resources at the Authority. This can be challenging to find the right balance from a communication and staffing burden perspective.

Management of Change Orders

Change orders are an inherent part of any project and require mutual consensus between the owner and contractor on the scope of work, budget and schedule of an identified change. If the Authority does not continue to effectively implement and adhere to established change order procedures, then the program will experience delays and the design builders may file claims for additional compensation, resulting in funding gaps and schedule impacts.

Key Mitigation Strategies to Address Change Order Risks:

- The issue is the ongoing management of change orders within the Authority. In 2021, the Authority implemented a revamped change control process for change orders. At the center of that improvement was a Change Control Committee to clarify roles and responsibilities, bring more rigor to the merit determinations of the change and more consistency to the process by ensuring the right documentation was completed by the right individuals. This is a continual process, and the Authority is taking steps to mature this area by developing key metrics to assess performance and improve our timelines.

LINES OF DEFENSE

In addition to the active management of enterprise risks, the Authority continuously embeds risk management in its day-to-day activities via the three lines of defense model illustrated in **Exhibit 6.2**.

The first line of defense, which consists of management and staff, is provided with policies and procedures to enable execution of their risk management activities and to ensure compliance during the regular course of business.

Where necessary, items of concern identified by the first line are escalated for review and decision making to the various groups that make up the second line of defense. As a member of the second line of defense, the Risk Management Office has a close

relationship with other assurance functions within the Authority, including the Internal Audit and Quality Process Management oversight functions, for communication and coordination purposes.

Finally, the Internal Audit function fills the role of the third line of defense to ensure that policies and procedures are functioning as intended and being followed by members of the first and second lines of defense. In tandem, the first, second and third lines of defense provide coverage of risk management activities within the Authority.

Exhibit 6.2: The Authority's Three Lines of Defense Model





Photo: Hanford Viaduct

Appendix A:

2023 Project Update Report Statutory Requirements

The California High-Speed Rail Authority prepares a biennial report to the California State Legislature on the status of the program. This report, which is submitted in odd-numbered years, is known as the Project Update Report.

The requirements for submission of a biennial Project Update Report were updated in June 2015 (AB 95) and require that on or before March 1, 2017, and every two years thereafter, the Authority provide a project update report, approved by the Secretary of Transportation, to the budget committees and the appropriate policy committees of both houses of the Legislature. AB 95 added a new Section 185033.5 to the Public Utilities Code to specify the information that Project Update Reports are required to provide to the Legislature.

The requirements for submission of a biennial Project Update Report were updated again in June 2022 (SB 198). SB 198 added a new Section 185033.7 to the Public Utilities Code to specify additional information that Project Update Reports and Business Plans are required to provide to the Legislature.

The Authority is also required to prepare and submit business plans to the Legislature, also on a biennial basis, in even-numbered years. Together, these two reports fulfill the requirements of Government Code 16724.4 which relates to annual reporting requirements associated with voter approved bond measures.

Statutory Requirements

(Existing Law): Project Update Report

As set forth in Section 185033.5, “On or before March 1, 2017, and every two years thereafter, the Authority shall provide a project update report, approved by the Secretary of Transportation and consistent with the criteria in this section, to the budget committees and the appropriate policy committees of both houses of the Legislature, on the development and implementation of intercity high-speed train service pursuant to Section 185030. The report, at a minimum, shall include a program wide summary, as well as details by project section, with all information necessary to clearly describe the status of the project, including, but not limited to, all of the following:

- (a) A summary describing the overall progress of the project.
- (b) The baseline budget for all project phase costs, by segment or contract, beginning with the California High-Speed Rail Program Revised 2012 Business Plan.
- (c) The current and projected budget, by segment or contract, for all project phase costs.
- (d) Expenditures to date, by segment or contract, for all project phase costs.
- (e) A comparison of the current and projected work schedule and the baseline schedule contained in the California High-Speed Rail Program Revised 2012 Business Plan.
- (f) A summary of milestones achieved during the prior two-year period and milestones expected to be reached in the coming two-year period.
- (g) Any issues identified during the prior two-year period and actions taken to address those issues.
- (h) A thorough discussion of risks to the project and steps taken to mitigate those risks.”

Statutory Requirements	Location
(a) A summary describing the overall progress of the project.	Executive Summary, Chapter 1, Chapter 4
(b) The baseline budget for all project phase costs, by segment or contract, beginning with the California High-Speed Rail Program Revised 2012 Business Plan.	Chapter 3
(c) The current and projected budget, by segment or contract, for all project phase costs	Chapter 3
(d) Expenditures to date, by segment or contract, for all project phase costs.	Chapter 3
(e) A comparison of the current and projected work schedule and the baseline schedule contained in the California High-Speed Rail Program Revised 2012 Business Plan.	Appendix B
(f) A summary of milestones achieved during the prior year and milestones expected to be reached in the coming year.	Executive Summary, Chapter 4
(g) Any issues identified during the prior two-year period and actions taken to address those issues	Chapter 5
(h) A thorough discussion of risks to the project and steps taken to mitigate those risks.	Chapter 6

Statutory Schedules Requirements (SB 198): Project Update Report

In 2022, SB 198 modified the requirements for the information that is to be included in the Project Update Report. SB 198 added a new Section 185033.7 to the Public Utilities Code, and this new section specified that a set of delivery schedules be added to the Project Update Report.

As set forth in Section 185033.7 “(b) (1), As part of the project update report that is due on or before March 1, 2023, pursuant to Section 185033.5, the authority shall develop schedules related to the delivery of all of the following tasks:

- (a) Completion of the 119-mile dual track segment from Madera to Poplar Avenue, which means Avenue 19 in the County of Madera to one mile north of the Tulare-Kern county line southward to north of Bakersfield, currently near Poplar Avenue.
 - (b) Completion of right-of-way, planning, and advance engineering for extensions to Merced and Bakersfield.
 - (c) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the authority that details the role of each in planning, constructing, and funding the connection in the City of Merced.
 - (d) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the authority covering the planning, funding, and operation of the proposed high-speed rail services from Merced to Bakersfield and the authority and approval for the San Joaquin Joint Powers Authority to contract for the operation of the high-speed rail services.
 - (e) Provision of an updated cost estimate with a stated probability level, or levels, of its ongoing contracts and for the work it is funding and managing that is required to complete the Merced to Bakersfield segment extensions.
 - (f) Completion of a funding plan that includes any additional federal funding awards for the Merced to Bakersfield segment.
 - (g) Additional milestones required for the completion of the Merced to Bakersfield segment and the full Phase 1 System pursuant to subparagraphs (A) to (F), inclusive.
- (2) The delivery schedules developed pursuant to paragraph (1) shall be included and updated in each subsequent business plan adopted pursuant to Section 185033 and project update report prepared pursuant to Section 185033.5.”

Statutory Delivery Schedules Requirements	Location
(a) Completion of the 119-mile dual track segment from Madera to Poplar Avenue, which means Avenue 19 in the County of Madera to one mile north of the Tulare-Kern county line southward to north of Bakersfield, currently near Poplar Avenue.	Chapter 1
(b) Completion of right-of-way, planning, and advance engineering for extensions to Merced and Bakersfield.	Chapter 1
(c) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the authority that details the role of each in planning, constructing, and funding the connection in the City of Merced.	Chapter 2
(d) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the authority covering the planning, funding, and operation of the proposed high-speed rail services from Merced to Bakersfield and the authority and approval for the San Joaquin Joint Powers Authority to contract for the operation of the high-speed rail services.	Chapter 2
(e) Provision of an updated cost estimate with a stated probability level, or levels, of its ongoing contracts and for the work it is funding and managing that is required to complete the Merced to Bakersfield segment extensions.	Chapter 3
(f) Completion of a funding plan that includes any additional federal funding awards for the Merced to Bakersfield segment.	Chapter 3
(g) Additional milestones required for the completion of the Merced to Bakersfield segment and the full Phase 1 System pursuant to subparagraphs (A) to (F), inclusive.	Chapter 1

Statutory Cost/Funding Requirements (SB 198): Project Update Report

In 2022, SB 198 modified the requirements for the information that is to be included in the Project Update Report. SB added a new Section 185033.7 to the Public Utilities Code, and this new section specified that a set of cost and funding requirements be added to the Project Update Report.

As set forth in Section 185033.7 “(c) (1), In order to demonstrate reasonable likelihood of adequate funding to complete the Merced to Bakersfield segment, the authority shall provide all of the following information in the project update report that is due on or before March 1, 2023, pursuant to Section 185033.5:

- (a) Estimated and actual civil works costs of the Merced to Bakersfield segment.
 - (b) Estimated and actual right-of-way, acquisitions, utilities, and other third-party agreement costs.
 - (c) Estimates of contract costs, including contingencies to cover change orders.
 - (d) Other costs, estimated and actual, including, but not limited to, rolling stock, interim use, and stations.
 - (e) Costs reported in a manner than can be comparable across reports.
 - (f) Updates on the authority’s progress on achieving project milestones, as established in the project update report or the business plan adopted pursuant to Section 185033.
 - (g) Funding commitments beyond the Merced to Bakersfield segment, and spending to meet those commitments to date, including funding sources used to meet identified funding commitments.
- (2) The information specified in paragraph (1) shall be included and updated in each subsequent business plan adopted pursuant to Section 185033 and project update report prepared pursuant to Section 185033.5.”

Statutory Cost/Funding Requirements	Location
(a) Estimated and actual civil works costs of the Merced to Bakersfield segment.	Chapter 3
(b) Estimated and actual right-of-way, acquisitions, utilities, and other third-party agreement costs.	Chapter 3
(c) Estimates of contract costs, including contingencies to cover change orders.	Chapter 3
(d) Other costs, estimated and actual, including, but not limited to, rolling stock, interim use, and stations.	Chapter 3
(e) Costs reported in a manner than can be comparable across reports.	Chapter 3
(f) Updates on the authority's progress on achieving project milestones, as established in the project update report or the business plan adopted pursuant to Section 185033.	Chapter 1, Chapter 4
(h) Funding commitments beyond the Merced to Bakersfield segment, and spending to meet those commitments to date, including funding sources used to meet identified funding commitments.	Chapter 3

Appendix B:

Capital Cost Evolution

This section compares how the Authority's cost estimates have changed over time for each project section and phase, including the program's operational elements, maintenance facilities and trainsets. **Exhibits B.0** through **B.3** show these comparisons and continue to demonstrate that costs become more refined with better information. It is important to note that cost changes can occur based on a variety of factors, including new alignment recommendations; changes to section start and end point assumptions; new project features, such as structures to facilitate wildlife movement; and coordination with community and regulatory stakeholders that result in scope changes. All of these can increase or decrease costs.

The estimates also reflect how the Authority's phasing strategy for delivering the full 500-mile system has evolved. Cost escalation for each project section was applied based on the phasing strategy to achieve revenue service that was assumed at the time. For example, the 2012 and 2014 Business Plans identified the initial line from Merced to the San Fernando Valley. The 2016 Business Plan then introduced Silicon Valley to Central Valley Line as the initial operating segment for revenue service. The 2020 Business Plan introduced the building block approach and the goal to deliver a new early operating segment from Merced to Bakersfield. These changes to the sequencing and timing affects completion schedules and calculation of the year of expenditure costs.

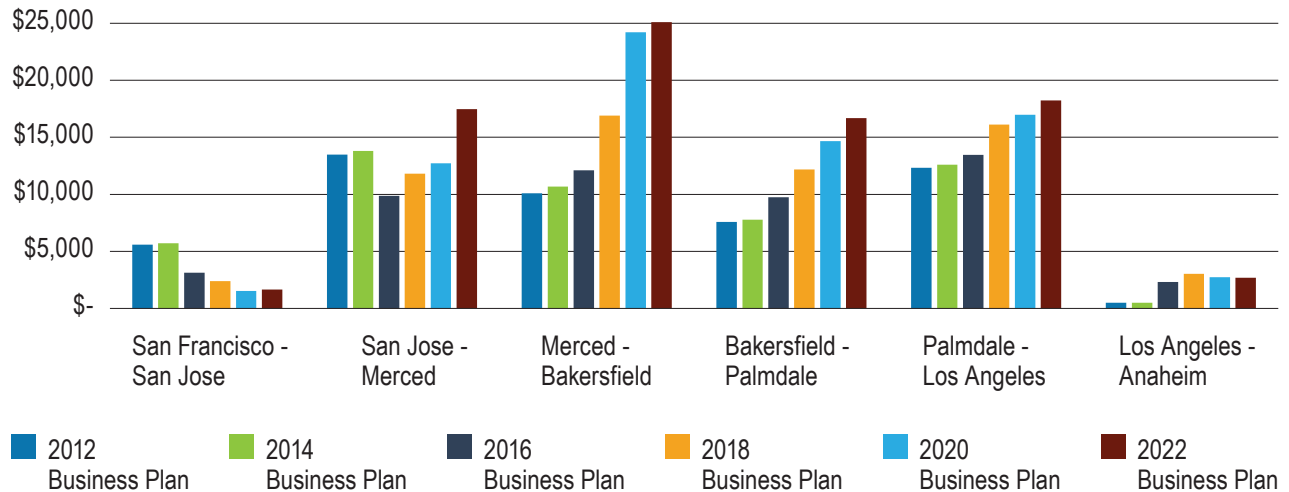
The capital cost estimates presented in the 2022 Business Plan reflected completion of the environmental evaluation process and obtaining Record of Decisions (RODs) for three project sections, one in

Northern California and two in Southern California. The San José to Merced section costs reflect design refinement to grade separate portions of the corridor to address third party requirements, along with stakeholder coordination to minimize disruptions to the surrounding communities and environments. The Bakersfield to Palmdale section costs reflect alignment revisions at the César E. Chávez National Monument/Nuestra Señora Reina de La Paz National Historic Landmark in Keene. The Burbank to Los Angeles section was updated to include the preferred alignment implementing an underground station at the Hollywood Burbank Airport and then transitioning from a tunnel to an at-grade blended corridor shared with Metrolink passenger trains and Union Pacific Railroad freight trains. The **2022 Capital Cost Basis of Estimate Report** prepared for the 2022 Business Plan provides a detailed analysis of these updated construction cost estimates, how they were prepared, how the cost estimates changed and why.

Historically, the Authority has not updated capital cost estimates in its biennial project update reports; they are, however, updated in this 2023 Project Update Report to be responsive to the legislative requirements laid out in SB 198 (2022-2023 Budget Act). The estimates in this report have been updated to include an updated estimate for the Merced to Bakersfield early operating segment and to also reflect the environmental Record of Decision for the San Francisco to San José project section. Updated costs to this section include shared use of tracks with Caltrain commuter service, a light maintenance facility at Brisbane, grade crossing safety updates and Caltrain station modifications.

CAPITAL COST ESTIMATE CHANGES BY SEGMENT SINCE 2012 (CONSTANT YEAR DOLLARS IN MILLIONS)

Exhibit B.0: Capital Cost-Constant Year Dollars (in millions)



CAPITAL COST ESTIMATE CHANGES BY SEGMENT SINCE 2012 (YOE MILLIONS)

Exhibit B.1: Capital Cost-Year of Expenditure Dollars (in millions)

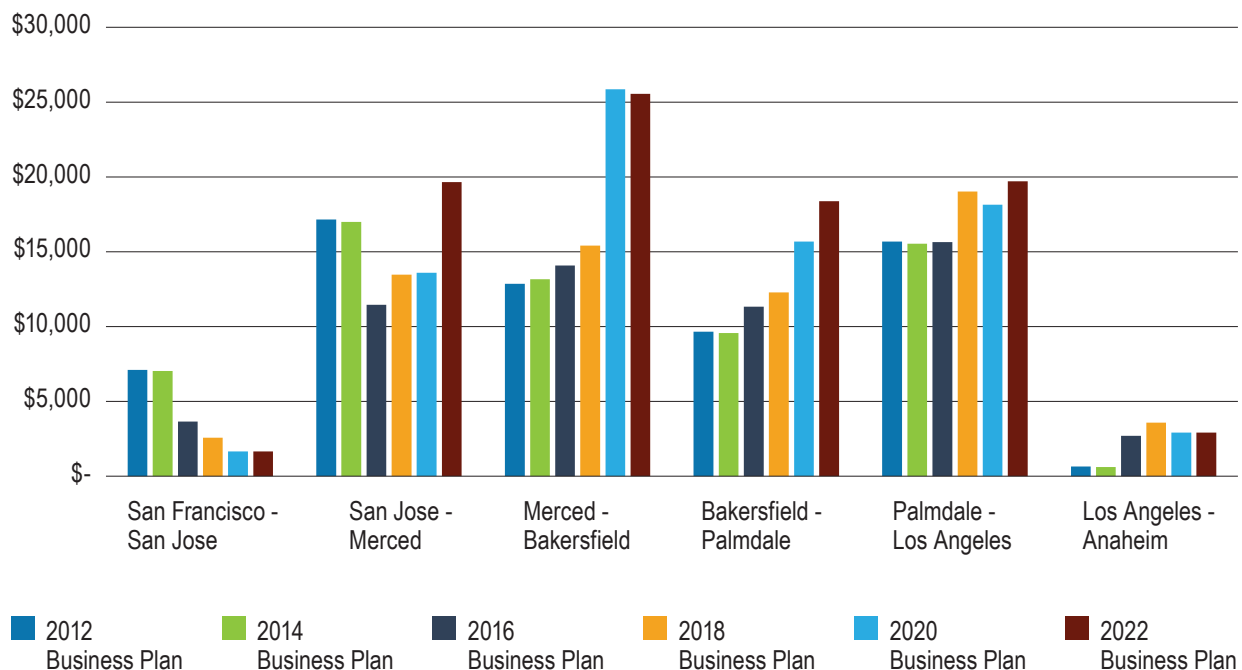


Exhibit B.2: Maintenance Facility and Trainset Costs (YOE\$ in millions)

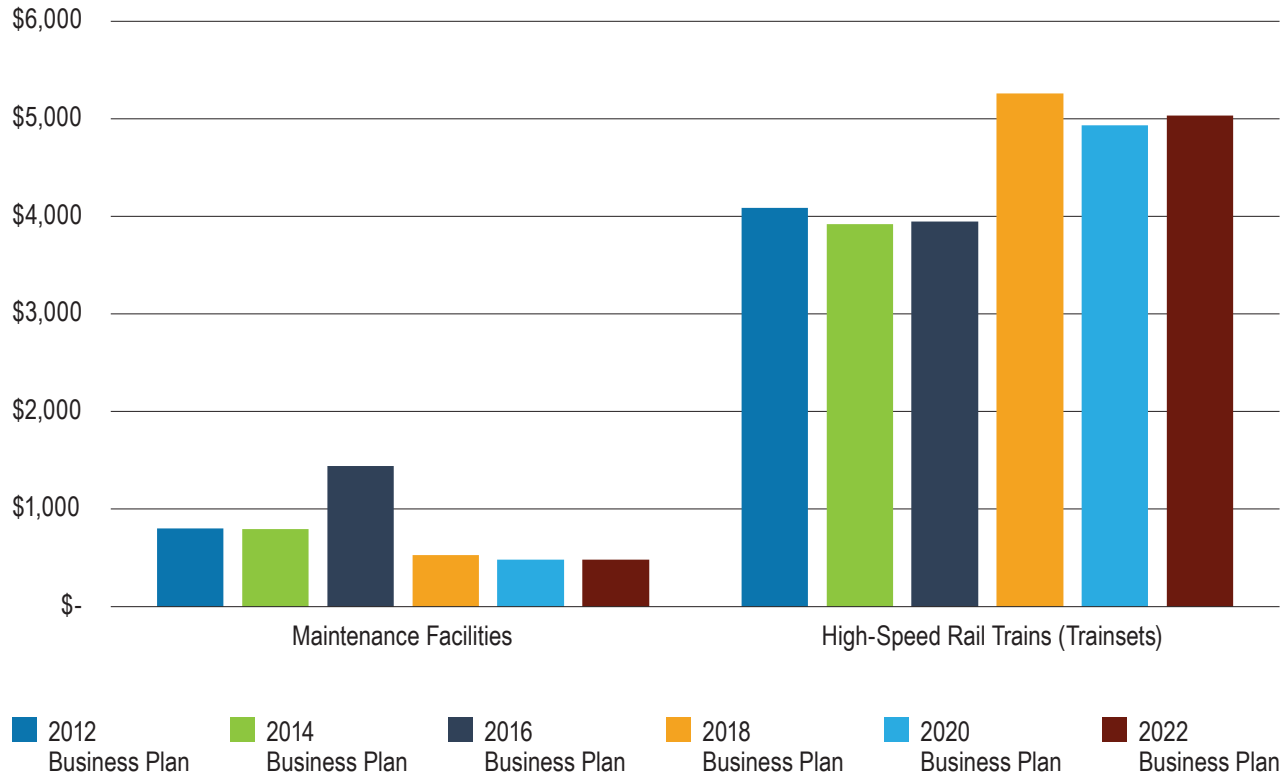
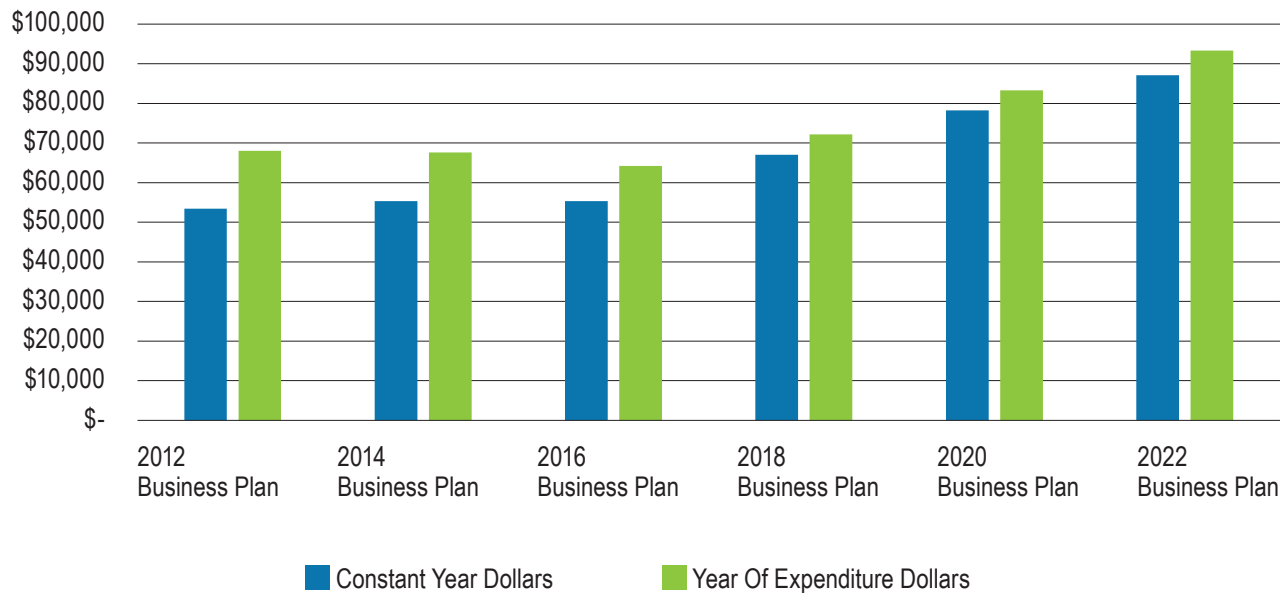


Exhibit B.3: Total Phase I System Cost Estimate (in millions)



Appendix C:

Correspondence



Gavin Newsom
Governor

Toks Omishakin
Secretary

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February 27, 2023

Mr. Brian P. Kelly
Chief Executive Officer
California High-Speed Rail Authority
770 L Street, Suite 620
Sacramento, CA 95814

RE: 2023 Project Update Report

Dear Mr. Kelly:

I have reviewed and approve the California High-Speed Rail Authority's 2023 Project Update Report (Report) for submittal to the California State Legislature as consistent with Section 185033.5 of the Public Utilities Code. It also adequately addresses the additional requirements set forth in AB 221, the Budget Act of 2023 and in SB 198 (Section 185033.7).

The updated cost estimates included in the Report represent realistic cost assumptions which reflect the significant challenges facing all major transportation infrastructure projects across the state and the nation. These include the impacts of the COVID-19 pandemic on global supply chains and the resulting instability and inflation that it created. It is appropriate to reset the estimates to reflect these recent impacts and enhance contingency for risk to meet federal guidelines just as other projects in California have had to do.

I support your efforts toward a sustained and durable partnership with the federal government to fund and deliver this project of national importance. The passage of the 5-year Bipartisan Infrastructure Law creates the opportunity to help fund and deliver a new mobility to the citizens of California and drive environmentally friendly transportation options for the nation.

California Transportation Commission • Board of Pilot Commissioners • California Highway Patrol • Department of Motor Vehicles
Department of Transportation • High Speed Rail Authority • Office of Traffic Safety • New Motor Vehicle Board

February 27, 2023

Page 2

The high-speed rail program is integral to the 2022 California State Rail Plan which establishes a long-term vision for a modern, integrated intercity passenger rail system that offers efficient passenger service, supports economic vitality and opportunity, and helps achieve our state's critical climate goals. I look forward to seeing further progress on this project that is integral to several other key goals for our state.

Sincerely,

Toks Omishakin

Toks Omishakin

Secretary



2023 Project Update Report



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